A Mixed-Methods Assessment of Time Spent Documenting by Nurses Using an Electronic Medical Records System

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Abstract - The focus of this quality improvement project was to identify possible improvements to the nursing documentation process at a large academic medical center by developing an understanding of the root causes of electronic medical records documentation inefficiencies, as decreasing the amount of time spent on documentation would allow for increased nurse interaction time with patients. The root cause analysis conducted in this study was grounded in a mixed methods approach, incorporating ethnographic observations, focus groups, and surveys with follow-up interviews. Additionally, phone-based work sampling was conducted to establish a baseline measure of documentation time efficiency. Data were collected from 121 nurses over six months, in four acute care units and one emergency department at the University of Virginia Medical Center. Focus group feedback, observations, and survey data were aggregated and used to identify five categories of possible improvements to the efficiency of documentation: user interface, equipment, process, communication, and extent of documentation. Survey data suggest that a significant proportion of nurses had never used several time-saving tools. When triangulated with the qualitative results, these findings suggest that nurses who understand and use built-in documentation tools spend less time on documentation overall. Work sampling results showed that 45.8% of time was spent on patient care, 16.5% on indirect care, 25.6% on documentation and 12.0% on miscellaneous tasks. While in line with findings from the literature, these task time distributions suggest the potential for further reduction to nursing time spent documenting through efforts to improve training consistency, remove unnecessary or repetitive documentation, and encourage use of time-saving tools.

Index Terms - Electronic medical records, Time spent documenting, Mixed-methods, Nursing informatics, Nursing documentation

Introduction and Background

Nursing availability is correlated with positive patient outcomes in clinical settings [1]. In order to improve the quality of patient care, hospital administrators are interested in increasing the amount of time nurses have available for direct patient care by reducing the amount of time nurses spend documenting in Electronic Medical Record (EMR) systems.

Given that EMRs are required by federal law and may provide significant healthcare quality and cost benefits, reducing their usage is neither feasible nor likely effective at increasing patient care [2]. Instead, efficiency improvements are sought, whereby documentation of equivalent quality and accuracy can be inputted in less time.

Both qualitative and quantitative work has been performed to examine the effect of the adoption of EMRs on the nursing profession. Kossman and Scheidenhelm found that 73% of nurses studied self-reported spending over half of each shift with the EMR and expressed concerns about hardware issues, decreased time with patients, and miscommunication [3]. Poissant et al. performed a systematic review of work sampling and time-motion studies performed on nurses and physicians when comparing paper-based systems and newly implemented EMR systems [4]. Twelve papers measuring nursing documentation time were included in this review, which reported documentation as a percentage of nurses’ shifts as low as 12% and as high as 35%. A 2160 observation work sampling study by Korst et al. found that day-shift nurses spent 19.2% of shifts documenting [5]. Yee et al. extended the research by Korst et al. by performing a large work sampling study, spanning 105 units in 55 hospitals [6]. Unlike traditional work sampling studies conducted with paper survey instruments, Yee’s study provided nurses with personal digital assistants, which prompted the nurses themselves to record the category of activity in which they were engaged. The categories used and associated percentage of time included direct care (47%), indirect care (18%), administration (5%), documentation (19%), personal (5%), waste (3%), and other (3%). They concluded that electronic systems have not resulted in an increase in time spent documenting over paper charts. In contrast, a 2010 study of nurses in California hospitals by Furukawa et al. found a 15-26% increase in documentation time after EMR system implementation, compared to the time period 1998-2007 [7].

Results from the literature were used to provide a baseline for comparison of results from the University of Virginia (UVA), to inform the design of research instruments (including surveys, observations, and the work sampling instrument), and to suggest possible causes of...
nursing documentation inefficiencies. The research by Yee et al. influenced the team’s decision to develop an SMS work sampling application that prompted nurses to respond with the category of work in which they were engaged when a prompt was received.

The literature extensively documents issues generally affecting EMR use in health systems. The purpose of this quality improvement project was to identify which pathologies are present at UVA, and suggest methods of addressing them.

METHODOLOGY

The team used a mixed methods approach to gather information about the primary barriers to nursing documentation workflow. Data were collected from stakeholder discussions, nursing observations, and a nursing survey. This information was then synthesized in an analysis of the root causes of documentation issues. Next, quantitative data were collected using SMS work sampling to determine the proportion of time nurses spend on various activities. These values were then compared to values in the literature and used to set a baseline for future studies at UVA.

I. Data Collection: Stakeholder Discussions

The team met biweekly with two key stakeholders – the Director of Nursing Governance Programs and an EMR Nurse Informaticist – to obtain feedback regarding the progress of the project and any new directions the team was exploring. Key deliverables to these stakeholders and the project sponsor included a Project Scope and Plan document and Mid-Term Design Presentation.

In October of 2013 members of the UVA Professional Nursing Staff Organization (PNSO) night shift committee participated in a focus group to generate a list of specific problems they have encountered with UVA’s EMR implementation. The committee was asked to identify possible causes of the problem as posted as “nursing documentation at UVA is cumbersome and time-consuming.”

The contributors were given sticky notes and asked to write possible problem causes on them and affix the notes to pieces of poster-board with the following headings, corresponding to problem categories: tasks, people, tools & technology, environment, organization, and other [8]. These categories may be considered as broad groups of cause types for work system problems.

After eight minutes generating possible causes, the committee was asked to apply their subject-area expertise. They viewed all of the sticky notes produced in the cause generation phase to familiarize themselves with the responses. The committee was then asked to use colored dots to mark which notes were the most probable and influential causes of the problem. The dots on each identified problem were tallied and summarized.

The team also attended a Super User meeting in March 2014. Super Users are technical experts on each floor whose purpose is to answer questions about the EMR in addition to their regular nursing duties. After presenting the most recent findings, the team members engaged the Super Users in generating and discussing possible solutions to the problem.

These potential solutions were used to inform the final recommendation.

II. Data Collection: Observations

In order to gain a first-hand understanding of nursing workflow at UVA, as well as select the most suitable units for this study, the researchers conducted observations on four units: adult acute care units 3 West (3W) and 5 West (5W), the Medical Intensive Care Unit (MICU), and the Emergency Department (ED). This initial group of units was a compromise between accessibility for the observers (which ruled out closed units), prevalence of EMR use, and recommendations from nursing administration of suitable units for a future intervention (3W is also designated as a unit for pilot testing new technologies).

These observations took place over two months at different times during the day shift. The unit, nurse, and time frame were all recorded, in addition to significant findings. Observation hours were broken into two-hour shifts and distributed approximately as two hours at the ED, four hours at the MICU, and twenty-four hours between 3W and 5W.

Observers reported first to the charge nurse in each unit and then were assigned to a nurse for two hours of shadowing. Nurses were first asked questions to learn more about the user being shadowed: experience with the EMR, relative proficiency with the EMR, how the nurse was taught to use the EMR, and experience at the UVA Medical Center.

Nurses were then asked questions to familiarize the observers with standard nursing workflow while observing the nurse’s various actions and procedures. Finally, nurses were asked more subjective questions such as the nurse’s perceived need for improvements in the EMR and more generally about the burdens of documentation.

To better understand current efforts to address documentation issues, the team shadowed an EMR visibility round. During these biweekly rounds, staff EMR technicians visit hospital units and answer any questions the EMR users may have.

III. Data Collection: Work Sampling

Work sampling is a statistical procedure that allows for the estimation of the proportion of time a worker spends on various specified categories by making a large amount of observations over an extended period of time. This procedure is important to establish the amount of time nurses actually spend documenting. The work sampling was performed on 3W and 3C and conducted for 5 days on each unit for the day shifts.

In order to conduct work sampling, a computer script was developed to sample self-reported activities of participating registered nurses (RNs) via phone-based Short Message Service (SMS). After an introductory SMS
message containing instructions for how to respond, participants received an SMS-based prompt every 30 minutes. Additionally, non-responsive nurses received reminder notifications 15 minutes later. Cumulatively non-responsive nurses – those who failed to respond 5 times in a row – were removed from the sample.

Participants were asked to respond as soon as safely possible by indicating which of four categories of activities they were engaged in at the time they received the prompt. The four categories were direct patient care, indirect patient care, documentation, and miscellaneous. These categories were informed by Yee et al., and simplified for this study to target documentation [6]. Participants were also given a reference sheet providing examples of specific activities and their corresponding categories.

The data were manually recorded to recode improperly formatted responses (e.g., when a participant responded with a description of what they were doing at the time rather than the corresponding category code). Additionally, null responses were removed from phones that were inactive or were assigned to a nurse who left early.

On the first day of work sampling at 3W, a team member was present to answer any questions the nurses had about the SMS work sampling and how the categories were defined.

IV. Data Analysis: Survey

To better understand which factors contribute most to nursing dissatisfaction with the EMR, the team conducted surveys of floor nurses on 3W and 5W. The questions on the surveys were designed to answer two questions: how do nurses perceive their documentation habits with respect to their colleagues, and how frequently do nurses use built-in EMR tools. Nurses rated themselves compared to their peers on their proficiency with the EMR, time spent documenting, and time spent with the patient. They also rated how often they used the following four tools: hot keys, glucose application management tool, system lists and work lists.

The tools on the survey (Table I) were chosen based on conversations with nurse informaticists and EMR super users at UVA – experts who consider these EMR features to alleviate documentation burden. If nurses responded that they did not use a tool on the survey, a short follow-up interview was conducted to determine why.

V. Data Analysis: Root Cause Analysis

Root cause analysis of UVA’s EMR documentation issues was conducted to identify one or more possible improvements to nursing documentation time efficiency at the UVA Medical Center. This analysis was grounded in Ishikawa’s fishbone method, and the categories were informed by Carayon et al. [8][9]. The root causes were visualized using Lucidchart, a web-based diagramming utility (www.lucidchart.com).

VI. Data Analysis: Work Sampling

Data collection was conducted from 8am – 8pm. Although the nurses’ shift started at 7am, phones are not assigned until around 7:30am. The data collected after 7:30pm were discarded because they involved a handoff between shifts. To examine biases, 3W and 3C were analyzed both separately and together to determine the proportion of time for each category.

A non-response at any time was automatically thrown out, and the team determined the response rate by the total number of responses that should have been received minus non-responses divided by the total number of responses that should have been received. The response rate of 83% was consistent across units.

To examine possible biases, response distributions were compared with and without the responses from the charge nurse using a Chi-Square test of proportions. Also, time of day was examined by binning the data in three categories according to time of day: morning (8:00am – 11:00am), mid-day (11:30am – 3:00pm), and afternoon (3:30pm – 7:00 pm) using a Chi-Square test of proportions.

Proportion of time spent on a category of tasks was calculated by number of responses divided by total number of responses minus null responses.

VII. Data Analysis: Survey

Survey data collection was conducted at 3W and 5W with 25 Registered Nurses. All surveys were anonymous and nurses were informed that their responses would not be linked to their identity. Different groups were examined using a Kruskal-Wallis nonparametric test to determine if factors such as age, time with the EMR, time at UVA, or tool usage have an effect on self-reported documentation time, proficiency with the EMR, and time with patients.

TABLE I: TOOLS AND THEIR DESCRIPTIONS

<table>
<thead>
<tr>
<th>Tool</th>
<th>Description</th>
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<tbody>
<tr>
<td>Work lists</td>
<td>A tool for outlining a nurse’s expected workflow during a shift.</td>
</tr>
<tr>
<td>System lists</td>
<td>A tool for locating patient information and keeping track of which patients a nurse is responsible for.</td>
</tr>
<tr>
<td>Glucose management application report</td>
<td>A tool for entering information and performing calculations related to patient glucose management.</td>
</tr>
<tr>
<td>Hot keys</td>
<td>Shortcuts to perform common operations in the EMR, like selecting values for fields and navigating between screens.</td>
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RESULTS

I. Work Sampling

With 1066 observations from 3W and 3C, the breakdown of nurses’ proportion of time was: direct patient care (45.8%), indirect patient care (16.5%), documentation (25.6%), and miscellaneous (12.0%). From examining possible biases, the inclusion of charge nurse in the data did not significantly
alter the response distribution. Documentation accounted for a higher proportion of time during mid-day (11:00-3:00) than morning or afternoon (p-value = 0.110).

II. Survey Results

Survey results did not reveal significant correlation between self-reported documentation time or tool usage and age, time with the EMR, or time at UVA.

Through the survey, nurses self-reported that they spend an average of 45% of their time documenting with the EMR (n=22).

III. Root Cause Analysis: Overview

Analysis of root causes identified five major categories: user interface, equipment, process, communication, and extensive documentation. A summary of the first level of contributing sub-causes is given in Table II.

TABLE II
SUMMARY OF ROOT CAUSE ANALYSIS FINDINGS

<table>
<thead>
<tr>
<th>High-level Cause</th>
<th>Second-level Causes</th>
</tr>
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<tbody>
<tr>
<td>User Interface</td>
<td>Repetitive tasks, excess (forced) homing, excessive optional fields, divide between novice users and power users, multiple paths, “getting lost”, difficult navigation, notification issues (too many/too few).</td>
</tr>
<tr>
<td>Equipment Issues</td>
<td>Rebooting, log-in time, WOWs, slow bar-code scanners, insufficient workstations, scanners aren’t charged.</td>
</tr>
<tr>
<td>Process Issues</td>
<td>Medication administration issues, interruptions, training issues, long hand offs.</td>
</tr>
<tr>
<td>Communication</td>
<td>Inter-unit communication, “borrowing” to replace missing medications, excessive paging, high frequency checkup orders, shift change communication.</td>
</tr>
<tr>
<td>Extensive</td>
<td>High patient:nurse ratio, high per-patient documentation load, unnecessary repetitive re-documentation, required documentation of not useful information.</td>
</tr>
</tbody>
</table>

IV. Root Cause Analysis: User Interface Issues

The EMR user interface can be difficult for nurses to navigate, particularly due to inconsistent and excessive homing, excessive optional fields, and multiple paths to destinations. Users of the system reported occasionally getting lost while documenting. Notification frequency was found to be inconsistent – in some contexts nurses report too many notifications, while in others too few.

In several cases, the multiple path problem manifested itself in the tools that exist to provide nurses with a more efficient way to document information. Observations and the survey informed the finding that time-saving tools were not utilized by all nurses. In some cases, nurses were aware of these tools, such as hot keys and system lists, but found the UI to complex to use. In other cases, nurses were wholly unaware of these tools as the UI allowed multiple paths for the user to perform tasks. These conclusions are supported by the survey data: 50% of nurses were unaware of the existence of hot keys or glucose application management tools. System lists were used by more than 60% of nurses surveyed, while only 28% of nurses used work lists consistently.

V. Root Cause Analysis: Equipment Issues

Equipment issues comprise both consistent and intermittent frustrations with the EMR. Nurses report consistently facing long login times, and bar-code scanners that take a long time to load. Nurses also reported that the mobile workstations take significant time and strength to navigate through unit hallways; patient rooms become overcrowded if one is required at the bedside. Intermittently, nurses will need to wait for long reboots of workstations, portable scanners that are not charged, and a lack of available workstations.

Observations and user feedback suggest that there are an insufficient number of workstations for the number of nurses needing to use the EMR. In our observations, nurses had to search the unit for available workstations and sometimes had to wait until another nurse had finished.

VI. Root Cause Analysis: Process Issues

Several process issues were identified related to documentation: medication administration issues, interruptions, long hand-offs, and training issues. These issues and their components can be seen in Figure 1, next page.

Nurses reported frustration with process surrounding medication administration within the EMR. In one example, a nurse reported having to force six different overrides to deliver a common medication. In addition, a culture of interruptions exists on the units, which chronically slows down documentation. Long hand-offs occurred because of the large amount of patient information to deliver to the next nurse.

A lack of consistent training was reported by observed nurses and focus group participants. Nurses’ initial understanding of the EMR was highly dependent on their preceptors. There was a perception among nurses and the administration that the quality of training was not consistent across preceptors. There were educational resources available to nurses in order to supplement their training foundation, but they were found to be inconsistently utilized. During the observed shift of the EMR visibility rounds, few questions were asked of the EMR technicians. Later observations with nurses revealed that many were unaware of the EMR visibility rounds as a resource. Super user nurses were on the floor to answer technical questions; however, they were often too busy with their own patient workload to be available as an educational resource. Consequently, best practices for EMR use were poorly disseminated across the hospital. Finally, the EMR’s integrated help library was found to be a rarely used resource.
VI. Root Cause Analysis: Communication Issues

Nurses reported that ineffective communication between healthcare providers led to lost time. Communication which took place through the EMR, for example during shift change or inter-unit transfers, interrupted regular patient care and documentation. One nurse noted that “shift change is where the ball gets dropped” in terms of effective documentation. On several occasions nurses were observed negotiating and correcting incompletely charted orders. In some cases, notes were documented in the incorrect location within the EMR and in another an improper order for a saline drip took two hours to resolve.

VII. Root Cause Analysis: Extensive Documentation

The observations, focus groups, and survey results suggest that nurses perceived that they generally over-document. Due to faults in the EMR’s interface, nurses were unnecessarily documenting information in multiple locations within the EMR, for instance when documenting removal of Foley catheters. Furthermore, whenever patients moved from one unit to another, nurses had to re-document certain patient information that had already been recorded on the other unit.

In addition, nurses were required to document some information for quality metrics, which some nurses believed did not directly improve patient care. One example was the recording of patient education where nurses were required to click check boxes of topics covered each visit.

Further, not all of the documentation requirements were clearly defined. This led to some nurses documenting more than necessary for each patient. These redundancies and inefficiencies resulted in a high per-patient documentation load. This load was compounded by the high patient-nurse ratio which caused nurses to feel unnecessarily overworked.

DISCUSSION

Documentation represents the second largest time consuming activity for nurses at UVA, after direct patient care. Increasing nursing documentation efficiency through the effective deployment of interventions would result in meaningful time savings and cost reductions. This study provides insight into the directions that such interventions should take.

The results from the work sampling were compared to previous results in the literature. This project’s result of 21.5% of time spent documenting is in line with results from Yee et al.’s research (19% of time spent documenting) and the meta-analysis by Poissant et al. (between 12% and 35% of time spent documenting) [6][4]. Survey results from this study differ from the work sampling results with respect to time spent documenting:
nurses self-reported on the survey that they spend more

time documenting than the work sampling results suggest.

Given the observed inconsistent levels of system

expertise (for instance, with tool usage), efforts to

increase the consistency and timeliness of training may
decrease nursing time spent documenting. In particular,

training may be more effective if it is targeted for the unit

on which a nurse works, and continues regularly as the

EMR is updated. Further, nurses develop their first EMR

work habits with their preceptor’s input. Standardizing

this instruction could improve nurses’ foundational

understanding of EMR tools and techniques.

Additionally, documentation requirements should be

critically analyzed to ensure that nurses are not required
to document more extensively or more frequently than

necessary. Documentation requirements not necessary for
diagnostics, regulatory compliance, or quality

improvement should be considered for removal.

Finally, issues with underutilized tools, as well as

complex or inconsistent user interface contexts, may be

addressed through increased communication between

nurses and EMR administrators. In particular, feedback

should be solicited from diverse nursing users to assess

what aspects of the EMR may be modified to better

facilitate the needs of the nursing user.

I. Strengths and Limitations

This research benefited from a mixed-methods

approach, which facilitated the synthesis of

complementary data. In particular, a novel approach to

work sampling was employed, which allowed for the

collection of more extensive data while eliminating the

potential for observer error. Additionally, the research

benefited from a prolonged engagement between the

researchers and the units of interest, occurring over the

course of six months.

Due to a lack of medical expertise, the authors were

unable to independently assess whether documentation

requirements were excessive. Instead, self-reporting by

nurses was relied upon, which offers an opportunity for

verification of this sentiment by future researchers.

The root cause analysis was limited to consideration of

proximal causes, defined as those that directly

contribute to nursing documentation inefficiencies. More

distal causes contributing to documentation inefficiencies

such as the lack of user feedback mechanism should be

considered in further analysis.

The work sampling instrument, while providing

results in line with previous literature, was not

independently verified. Future work comparing results

from SMS work sampling with those obtained through

traditional, observer-based work sampling is necessary to

confirm this as a valid research instrument.

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