Accepted Manuscript online: 2022-06-03 Article published online: 2022-07-20

Implementing Best Practices to Redesign Workflow and Optimize Nursing Documentation in the Electronic Health Record

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Appl Clin Inform 2022;13:711–719.

Abstract

Background Documentation burden associated with electronic health records (EHR) is well documented in the literature. Usability and functionality of the EHR are considered fragmented and disorganized making it difficult to synthesize clinical information. Few best practices are reported in the literature to support streamlining the configuration of documentation fields to align clinical workflow with EHR data entry elements.

Objective The primary objective was to improve performance, reduce duplication, and remove nonvalue-added tasks by redesigning the patient assessment template in the EHR using best practice approaches.

Methods A quality improvement approach and pre-/postdesign was used to implement and evaluate best approaches to redesign standardized flowsheet documentation workflow. We implemented standards for usability modifications targeting efficiency, reducing redundancy, and improving workflow navigation. The assessment type row was removed; a reassessment section was added to the first three flowsheet rows and documentation practices were revised to document changes from the initial assessment by selecting the corresponding body system from the dropdown menu. Vendor-supplied timestamp data were used to evaluate documentation times. Video motion-time recording was used to capture click and scroll burden, defined as steps in documentation, and was analyzed using the Keystrok Level Model.

Results This study's results included an 18.5% decreased time in the EHR; decrease of 7 to 12% of total time in flowsheets; time savings of 1.5 to 6.5 minutes per reassessment per patient; and a decrease of 88 to 97% in number of steps to perform reassessment documentation.

Conclusion Workflow redesign to improve the usability and functionality decreased documentation time, redundancy, and click burden resulting in improved productivity. The time savings correlate to several hours per 12-hour shift which could be reallocated to value-added patient care activities. Revising documentation practices in alignment with redesign benefits staff by decreasing workload, improving quality, and satisfaction.

Keywords
- flowsheets
- patient reassessment
- documentation burden
- electronic health records
- workflow evaluation
- redesign
- nursing

received
January 4, 2022
accepted after revision
June 1, 2022

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Georg Thieme Verlag KG,
Rüdigerstraße 14,
70469 Stuttgart, Germany

DOI https://doi.org/10.1055/a-1868-6431.
ISSN 1869-0327.

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Background and Significance

Electronic nursing documentation provides a mechanism to exchange information, record clinical care, and is necessary for accreditation and regulatory agencies.[1] However, documentation tools, such as the electronic health record (EHR), are fragmented, leading to variability in care. Motion studies identified that nurses spent 24 seconds per click.[2] During an average 12-hour shift, nurses spend an estimated 19 to 40% documenting patient care and record data in over 600 flowsheet rows.[3–8] One quarter of nurses declared the EHR as cumbersome and almost half stated time spent documenting was problematic.[9] Further, 90% of nurses included in one study stated that the EHR had a negative effect on nurse–patient communication and 94% disagreed that the EHR promotes communication between the nurse and other members of the health care team.[10] As a result, system workarounds were created, posing threats to patient safety.[10,11]Current EHRs are built to support data entry, not to guide the delivery of highly reliable evidence-based care,[3,4,10–12] Despite nurses being the predominate user of the EHR, nursing documentation is not housed in a singular location within the record, disrupting their ability to synthesize information and formulate plans of care.[8] To further challenge nurses, documentation expectations are expanding, conflicting with nurses' goals for more time interfacing with patients and integrating care which impacts patient engagement, satisfaction, and quality of care.[3,11,12] This poor usability and incompatible workflows contribute to documentation burden, aggravate the challenges of clinically complex patient care, and are associated with clinician dissatisfaction.[3,5,8,9,11,12]

The American Nurses Association and the American Academy of Nursing collaborated to nationally address nursing documentation burden and standardization.[13] The American Nurses Association Principle for Nursing Documentation states, "nurses should aim to ensure that critical and necessary data and information are documented while avoiding duplicative documentation. To do so, nurses need to understand the forces and other factors that shape the requirements of practice-specific documentation."[14] These efforts, focused on workflow redesign, may progress toward clinician goals to decrease nonvalue-added tasks, add meaning to work and allow more time for fundamental patient care.[1,12,15]

Workflow is defined as the execution of a series of steps to perform a clinical activity. Poor workflow designs include the cognitive burden associated with navigating multiple screens to locate information, lack of integration from prior admissions, poor handoff tools, and differing views of the EHR based upon access such as a nurse versus a physician.[9,12,15] Best practices to improve workflow and usability of documentation include improved visualization of essential data elements and limiting data rows, voice recognition, and integration with mobile technology which result in improved efficiency and less time spent documenting.[1,4,13,16] Despite this knowledge, however, health care organizations have not fully empowered nurses to iterate EHRs to meet their needs. Combining the efforts of professional organizations and individual health care organizations may lead to improved workflow and value of nursing documentation.

A large academic health system located in the southeastern United States was concerned about the time nurses spent in documentation. Three data sources were used to determine baseline state of EHR documentation including vendor timestamp data, an assessment survey, and video motion-time recordings.

Vendor Supplied Timestamp Data

The health system utilizes EPIC, a commercial cloud-based EHR. The vendor provides timestamped audit logs titled "Nursing Efficiency and Assessment Tool" (NEAT), a methodology used solely by the EHR vendor and is not a validated tool. NEAT is a data collection log tool that collates time spent in the EHR by user or role, tracks graphical user interface, and observes typical system behaviors by monitoring mouse clicks and keystroke information.[17,18] NEAT applies a 30-second inactivity timeout in its calculations.[17,18] Inactivity refers to the amount of time (minutes) that a clinician is logged into the EHR but not using an application.[19]

Vendor-supplied timestamp data from the following two time periods were analyzed to capture baseline time spent by nurses documenting in the EHR prior to the intervention: (1) February 1, 2019, to April 30, 2019, and (2) February 1, 2020, to April 30, 2020. Two sets of data were reviewed for comparison due to alterations in patient populations that occurred early 2020. The 2019 timestamp data showed that nurses spent157 minutes documenting in the EHR, on average, in a 12-hour shift (22%).[17] The 2020 timestamp data, prior to the intervention, reflected time spent in documentation increased by 3.25% to an average of 162 minutes per 12-hour shift (22.5%).[18] During these two time periods, the health system ranked in the lower 35th and 50th percentile rankings, respectively, among the organizations using the same EHR system.

Assessment Survey

An electronic survey was used to obtain feedback and identify recommendations of registered nurses employed in all areas of the health system including inpatient, procedural, ambulatory, and perioperative services (►**Supplementary Appendix A** available in the online version). Eligible participants included all direct patient care clinical registered nurses or ambulatory registered nurses employed by the health system ($n = 5{,}360$). The assessment survey was developed by the project lead, approved by the system nurse executive committee, and the Chief Nursing Informatics Officer. The survey collected demographic data, identified areas of the EHR for optimization, and solicited which sections of flowsheets needed improvement. Since the survey was developed by the project lead, it was not considered a validated survey.

The assessment survey was delivered electronically in July 2020 to eligible staff through a newsletter distributed by the Vice President of Patient Care & System Chief Nurse Executive weekly for 2 weeks. It was also advertised through

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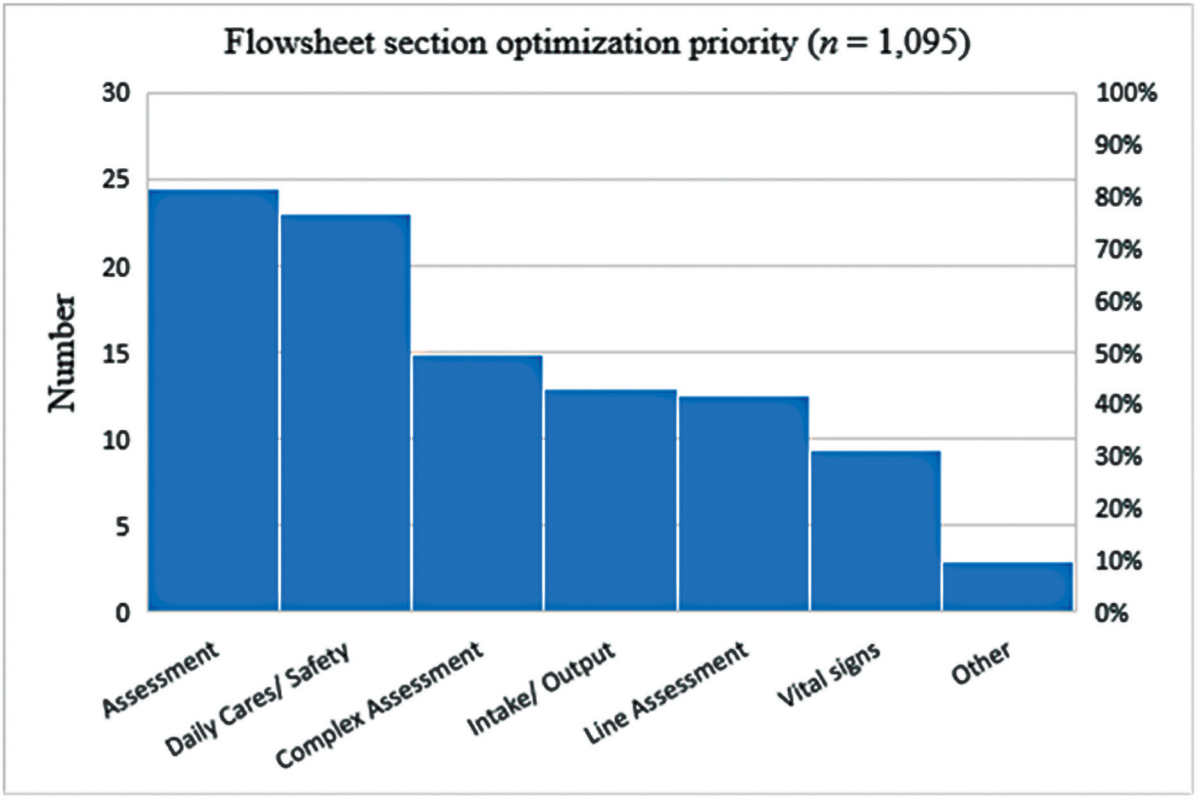

Fig. 1 Survey results flowsheet section optimization. Note: Flowsheet section ranking areas of priority.

daily team huddles and nursing governance meetings. The survey remained accessible for 16 days.

Health system registered nurses ($n = 1{,}095$, 20.4% response rate) completed the needed assessment. Sixty percent ($n = 657$) of those who completed the survey were located in the inpatient setting. Baseline survey results indicated that nurses, on average, perceived that they dedicated 43% (standard deviation [SD] = 19.0, range = 0–100%) of their shift to documentation, and 45% (SD = 26.7, range = 0–100%) of the documentation was duplicative and unnecessary. Among the inpatient, ambulatory, and procedural settings, the flowsheets ranked the highest for needing optimization, and within flowsheets, the "assessment" section was noted as the priority, followed by the "daily cares/safety" section (►Fig. 1).

Video Motion-Time Recording

The video motion-time recording was used to calculate the number of steps to complete nursing reassessment documentation. Video motion-time recording was conducted by the project lead and nursing informatics student in November 2020 to analyze the workflow of nurses and calculate actual time in documentation within the EHR in minutes and seconds. The recording captured the nurse in their home clinical setting on computers approved for documentation. The recording location was away from the patient care area to avoid distractions and interruptions. Both of the nurses' arms, the computer screen, and keyboard were recorded to capture documentation and ensure integrity using the same computer. Each nurse was manually timed using a video recording tablet to capture time spent in documentation. The EHRs of patients with clinical conditions, as deemed by the project lead, were selected to decrease variability in assessments. Patient confidentiality was maintained during the video recording shielding patient identifying information by a barrier to ensure compliance with confidentiality rules. Patient identifiers were not recorded by the tablet or study team. Each nurse documented an initial nursing assessment and reassessment for a patient they were assigned that can be shifted based on current documentation policy. Motion time recordings ranged from 1 minute 30 seconds to 6 minutes 37 seconds prior to intervention. Clicks, scrolls, and mouse movements were translated into number of steps using the Keystroke level Model (KLM) for the nursing assessment and reassessment documentation.

Based on the needs assessment survey, vendor supplied baseline data, and video recording data, a quality improvement intervention was developed to redesign nursing workflow to optimize time spent in documentation. The survey and NEAT data identified the top inpatient priority and flowsheet reassessment to decrease the burden associated with documentation and align with the EHR vendor-based 25th percentile benchmark.

Objective

The purpose of this study was to implement and evaluate the effectiveness of modifications made to nursing reassessment

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documentation across a large health system to decrease time spent in documentation using timestamped audit logs and video motion-time recording.

Methods

Organizational Setting

The study was initiated in each of the three hospitals and over 150 ambulatory platforms within a single health system in the southeastern United States. Of the three hospitals that encompass the health system, the largest was an academic center with 1,048 licensed inpatient beds and, located within the same geographical region, each of the two remaining hospitals had 369 and 186 inpatient beds, respectively.

Study Design

A quality improvement approach using a pre-/postdesign was used to observe nurses' time spent documenting in the EHR to evaluate an intervention to improve time spent and workflow. The focus of this study is nursing documentation, including flowsheets. Flowsheets are defined as the section of the EHR in which nurses document their physical assessments, care delivery, and associated interventions per the facility's nursing standards of care.

Nursing documentation workflow was measured by video motion-time recording, and it was analyzed using the KLM.[20,21] The KLM is an associated usability technique that identifies and quantifies the problems and efficiency of an interface in entirety.[20,21] The model is considered an expert evaluation tool in cognitive task analysis and requires usability expertise.[21] The KLM was performed by two graduate nursing informatics students at the Duke University School of Nursing and was validated by the health system's Chief Nursing Informatics Officer. The two students were deemed competent by the professor to perform the KLM calculations. The KLM calculations were also reviewed and verified by a nursing informatics program manager, though intercoder reliability was not calculated. The Statement on Reporting of Evaluation Studies in Health Informatics (STARE-HI) provided the framework to report the results.[22]

The health system Institutional Review Board deemed this project as exempted as a quality improvement project (protocol no.: PRO00106614).

Participants

Two adult inpatient departments at the academic center were identified as a sample to conduct video motion-time recordings. The Medical Intensive Care Unit (MICU, $n = 116$), a 24-bed unit, specializing in pulmonary conditions, invasive monitoring, and adjunctive therapies and the Medical Stepdown Unit (MSDU, $n = 45$), a 31-bed unit, specializing in pulmonary progressive care were selected based on three criteria as follows: (1) accurate representation of the majority patient population in the health system deemed by the health system Nurse Executive Council, (2) willingness of the staff to participate, and (3) convenience for the project lead.

Within these two groups combined, the assessment survey response rate was 14.7% ($n = 161$). The majority of intervention participants were female ($n = 146$, 91%) and White ($n = 118$, 73%) with an average age of 34.8 (SD = 9, range: 20–64) years. The average tenure at baseline in the MICU was 7.9 years (SD = 7.8, range: 2 months–24 years) and in the MSDU was 6.3 years (SD = 7.7, range: 2 months–16 years). The predominant job classification as measured by the clinical ladder position was clinical nurse 2 ($n = 432$, 41%; ►Fig. 2).

Two nurses were selected from each unit to participate in the video motion-time recording. One nurse in each unit was considered "novice" and the other was considered "tenured." Novice was defined as less than 1 year experience and tenured was greater than 3 years' experience. Novice and tenured were selected based on the population of nurses on the two units.

Intervention

A committee comprised of direct care nurses was established to identify best approaches for documentation modifications targeting efficiency, reducing redundancy, and improving workflow of documentation fields. The committee was chaired by the project lead, a nursing informatics systems specialist, and program manager clinical practice with the goal to reformat the workflow of the flowsheet and revise documentation practices.

Revisions to the reassessment documentation were developed between November 7, 2020, and January 15, 2021, based on the committee's feedback, input from health system nursing professional governance councils, comprised by nurses across the health system, and led by nurse leaders and includes the clinical practice council and the nursing informatics council. The revisions were approved by nursing informatics and health system nursing leadership.

Six segments of nursing documentation were optimized including (1) the number of visible rows on access, (2) duplication of the information noted elsewhere in the EHR, (3) groupings of bodily systems for simplicity and appropriateness, (4) pertinence of information to that section including should it be moved or deleted, (5) click burden, and (6) whether the information was required for billing or regulatory purposes.

The charting type row, which was used to define if the assessment was for admission, assessment, or reassessment, was removed and the reassessment section of the flowsheet was moved from the last row in the flowsheet to the first row, to facilitate convenience and accessibility (►Fig. 3). Three new rows were added under the reassessment section to denote reassessment practices based on the patient's level of care, focused reassessment for no changes, focused reassessment with changes, and full reassessment (►Fig. 4).

Additional enhancements included simplification of the reassessment documentation practices to document "no changes" or "changes noted" in the reassessment row.

Dropdowns were added to the focused reassessment section for the nurse to select the body system(s) being reassessed. If the patient did not have any changes in their clinical condition from the initial shift assessment, the nurse would document in the "focused reassessment no changes"

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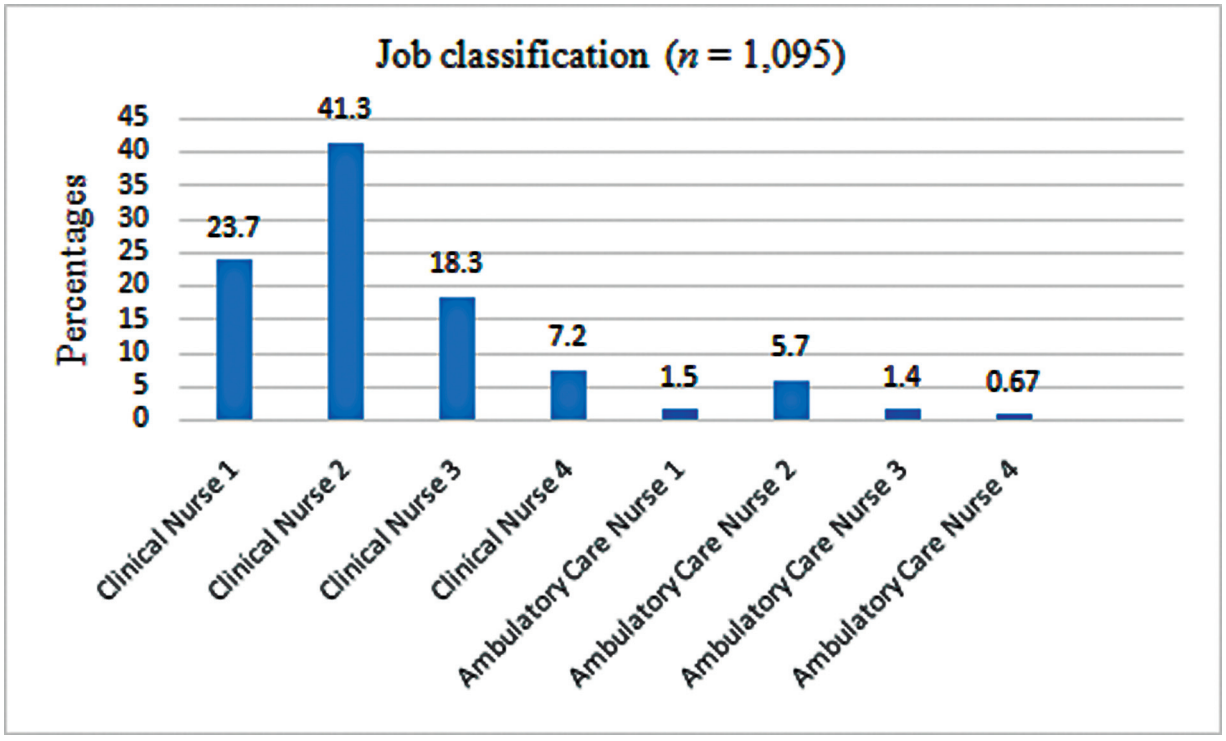

Fig. 2 Nursing demographic data by job classification and clinical ladder level. Note: The figure represents percentage of registered nurse staff by job classification and clinical ladder level. Clinical Nurse is inpatient setting. Ambulatory care nurse is procedural setting. Level 1 is entry level with progression through levels 3 and 4 as tenure increases.

Fig. 3 Documentation prior to intervention. Note: Last row of flowsheet was the charting type. Nurse would select shift assessment or shift reassessment.

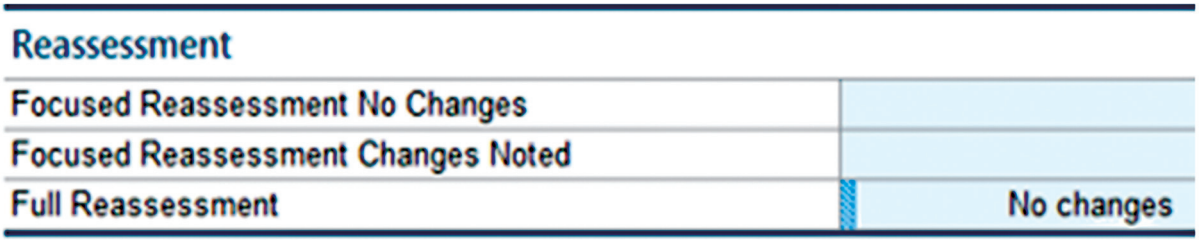

Fig. 4 Documentation changes in flowsheets. Note: If there were no changes from the initial assessment, the documentation of "no changes" is all that is required.

row, and select all body systems that were reassessed from the dropdown menu. Documentation is complete at this point. If changes in the patient's clinical condition were noted from the initial assessment, the nurse would document in the "focused reassessment changes noted" row and select the corresponding body systems from the dropdown menu. The nurse would proceed to only document in the system section that had the changes (►Fig. 4). For intensive care units, documentation occurs in the "full reassessment" row. If the patient did not have any changes from the initial assessment, the nurse would select "No changes" from the dropdown menu and documentation is complete. If changes were noted from the initial assessment, the nurse would select "changes noted" and document in the body systems in which changes were noted.

Nursing Education and Dissemination

Extensive education was created and disseminated by the project lead including a learning module, graphical slide presentation, educational fliers, and presentations at unit

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staff meetings and nursing leadership meetings. Daily rounds on the two pilot units were performed by the project lead to ensure staff understood the revisions and reeducation was provided as needed.

Results

Outcome metrics included time spent in EHR, time spent in flowsheets, time savings in minutes and seconds, and number of steps. Postintervention data were obtained using vendor-supplied timestamp data and video motion-time recording.

Vendor-supplied timestamp data at 3 months' postintervention reflected that the time spent in nursing documentation decreased per user across the health system. Overall, time spent in nursing documentation decreased from 162 to 132 minutes per shift.[19] In the MICU, the time spent in EHR documentation following revisions to the reassessment section of the flowsheet resulted in a 10% decrease from 169 average minutes to 152 average minutes in EHR, and a 17% reduction from 202 average minutes to 167 average minutes in the MSDU.[19]

The vendor-supplied timestamp data also reflected at 3 months' postintervention, time spent in flowsheets decreased by an average of 10 minutes each shift across the health system.[19] The MICU decreased 2 from 89.7 to 88.5 minutes and MSDU decreased 12% from 74.7 to 65.7 minutes.[19] At 6 months' postintervention, the vendor-supplied timestamp data reflecting continuing improvement. Minutes in EHR for the MICU decreased 5 additional minutes (3%) to 147 minutes and the MSDU decreased 3 additional minutes (1%) to 164 minutes. Minutes spent specifically in flowsheets for the MICU decreased to 72 minutes (19.7%) and the MSDU decreased to 55 minutes (26%).

Table 1 Video motion-time recording times and time savings from pre- (PRE) to postintervention (POST)

	Video time PRE	Video time POST	Time savings
MSDU novice MSDU experienced	4:53 6:37	0:36 0:09	4:17 6:28
MICU novice MICU experienced	3:19 1:30	0:03 0:03	3:16 1:27

Abbreviations: experienced, greater than 3 years' experience; MICU, medical intensive care unit; MSDU, medical stepdown unit; novice, less than 1 year of experience.
Note: The table identifies the time in minutes:seconds before and after the intervention.

The video motion-time recording of nurse documentation also revealed details about estimated time savings incurred as a result of the intervention. In comparison to baseline, the intervention led to a time savings range of 1:27 (minutes:seconds) to 6:28 (minutes:seconds) per reassessment per patient depending on the unit and experience level (clinical ladder level) of the nurse (►Table 1).

The number of steps to perform the reassessment documentation decreased on both units, with a notable reduction on the MSDU (►Fig. 5). The MICU novice nurse had a 19% decrease in steps to perform documentation and the experienced nurse in MICU sustained a 96% reduction. The MSDU

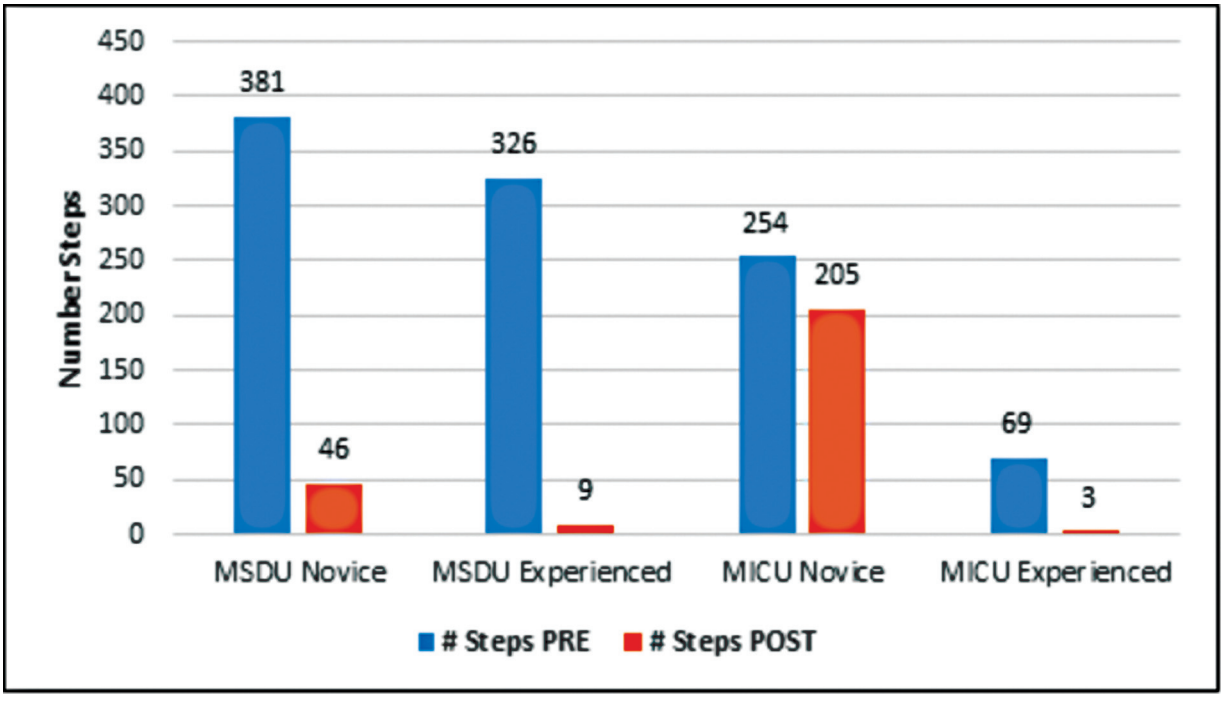

Fig. 5 Number of steps in documentation per unit and staff. Note: This table demonstrates the number of steps in documentation prior to and after the intervention. Experienced, greater than 3 years' experience; MICU, medical intensive care unit; MSDU, medical stepdown unit; novice, less than 1 year of experience; POST, postintervention; PRE, preintervention.

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novice nurse had an 88% reduction in steps, and the experienced nurse had a 97% reduction in steps.

Discussion

Findings of this study demonstrate that implementation of best practice and redesign of the assessment section in the flowsheet section of the EHR decreased time in nursing documentation. The project standardized nursing flowsheet reassessment documentation to decrease inefficiencies and the burden of documentation which was an impediment to delivering effective patient care. Workflow redesign and documentation practice changes led to a notable improvement in time in the EHR, time in flowsheets, time spent in documentation, and number of steps to complete reassessment documentation.[4,16,23–25]

The redesign process utilized a shared governance approach engaging staff to contribute to the redesign and build to decrease documentation burden. Staff feedback was overwhelmingly positive with regard to template organization, documentation structure, and time savings. Similar to previous studies that state improving functionality to align with clinician workflow,[4,16,23] staff in the current study provided anecdotal comments that they were extremely grateful and satisfied with the changes allowing for more time in direct patient care versus nonvalue-added tasks.

Since there is a nursing informatics department at the facility, the reassessment redesign took 24 hours. No cost overages were incurred since optimization of nursing documentation is a job expectation of the nursing informatics department. The study results align with the National Library of Medicine's "25 × 5" goal to decrease documentation burden by 75% by 2025.[26]

Strengths and Weaknesses of the Study

Limitations to the intervention include lack of generalization if a facility does not have an EHR with timers and audit logs capable of discrete data field capture. Facilities without the capability of audit logs should evaluate video motion-time recording options to capture data. Data collection was limited to two medical units, neither surgical units nor off-shifts were included in the data collection process which may not represent true translation of findings.

The second limitation pertains to KLM. The KLM assumes that tasks are performed linearly and it does not consider individual staff differences in performance including workload.[20,21] The addition of mental processing workload can contribute to add KLM time calculations. The video-recording assisted with capturing mental processing as staff paused during documentation; however, distractions could have inadvertently added to this pause due to the geographical design of the unit and complexity of patient care. When nurses are video recorded, it may potentially alter their time spent in documentation making them more or less efficient when they know they are being watched. Lastly, a postimplementation survey was not obtained to document perceptions after the intervention; only anecdotal feedback was obtained.

Results in Relation to Other Studies

This novel best practice approach established the foundation for a repeatable process to organize and align EHR documentation with nursing workflow.[24–29] Building on the work of Strudwick et al[28] and Kutney-Lee et al,[30] both the studies successfully decreased redundancies,[3,8,28,29] eliminated nonvalue-added tasks, and decreased time in flowsheets to improve workflow for nurses.[4,16,23] Documentation practice standardization provides structure decreasing ambiguity among clinicians. Implementing practice standards that support workflow are critical to excellence in patient care delivery.[18,19,26] Revisions to nursing documentation practice standards that simplified and minimized documentation requirements resulted in decreased documentation burden.[3,12]

Meaning and Generalizability of the Study

These results demonstrated generalizability through the use of a structured template and minimizing flowsheet reassessment data elements.[4,25] This best practice approach was successfully translated across inpatient, ambulatory, and procedural areas. This intervention addresses and overcomes previously identified gaps in EHR functionality.

An effective and efficient EHR promotes better usability. Usability is defined by the Healthcare Information and Management Systems Society as "the effectiveness, efficiency, and satisfaction with which specific users can achieve a specific set of tasks in a particular environment."[23,31] Usability redesign includes limiting the display of information, rearranging content, improving the search function, and decreasing redundant documentation.[28,29]

Motivation to sustain change is enabled through trust, influential leadership, and positive reinforcement from colleagues.[23] Recognition, peer pressure, and engaging staff to champion the effort sharing their personal time savings assisted with sustainment of the process change. Champions are role models who are more familiar with the system and comprehend the significance that the EHR can contribute to patient care.[30] The use of champions promoted engagement, motivated fellow nurses, and were a unit-based resource.

Conclusion

Diminishing documentation burden is vital to decreasing nursing workload and supporting safe patient care. Workflow redesign of the nursing reassessment flowsheet was accomplished using a data-driven, collaborative, and shared governance approach; acknowledging staff contributions to the build and redesign; and by assuming low expense by engaging the system nursing informatics team. This approach reduced stress associated with the EHR, improved efficiencies, and decreased waste from duplicative documentation.[12,27] EHR usability and functionality revisions, two critical components of redesign, demonstrated notable improvement in time spent in documentation at the facility, MICU, and MSDU and supported logical nursing workflow. Minutes in nursing documentation, specifically

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flowsheets, and the number of steps decreased postintervention achieving the EHR vendor benchmark of 25th percentile ranking.

Clinical Relevance Statement

Identification of nursing documentation areas needing optimization is crucial to replicate this workflow redesign process across other health systems, greater understanding of documentation burden is necessary to optimize configuration to improve usability by decreasing number of clicks, redundancy, and time in documentation.

The use of EHR analytics including system timers, logs, and vendor data can substantiate the transformation of nursing documentation and inform the facility of priority areas for optimization.[2,4,32] Redesign of usability function should include only essential documentation to support clinical care.[30]

Multiple Choice Questions

1. When evaluating time spent in the electronic health record (EHR), which usability technique identifies and quantifies the complexity and efficiency of an interface?
   a. The Keystroke Level Model (KLM)
   b. Applied informatics
   c. Time motion studies
   d. Observational studies

   Correct Answer: The correct answer is option a. The KLM is a goals, operators, methods, and selections (GOMS) usability technique that identifies and quantifies the complexity and efficiency of an interface in entirety. The model is considered an expert evaluation tool in cognitive task analysis and requires usability expertise.

2. When redesigning nursing documentation, which analytics prioritize the areas for optimization?
   a. Video motion-time recordings
   b. Vendor supplied EHR data
   c. Facility committees
   d. Staff feedback

   Correct Answer: The correct answer is option b. The use of EHR analytics including system timers, logs, and vendor data can substantiate the transformation of nursing documentation and inform the facility of priority areas for optimization.[2,4,32] Redesign of usability function should include only essential documentation to support clinical care.

Protection of Human and Animal Subjects

Protection of Human and Animal Subjects Human and/or animal subjects were not included in this project.

Conflict of Interest

None declared.

Acknowledgments

The authors would like to thank the following individuals for helping in this study:

Angela Cozart, Nursing Informatics System Specialist II.
Breanne Payne, Program Manager, Clinical Practice.
Pam Porter, Nursing Informatics System Specialist I.
Bob Brassil, Director Clinical Data Analytics.

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