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Taking Action Against Clinician Burnout Through Reducing the Documentation Burden With an Operating Room Supply Scanning Approach

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Documenting surgical supply items in the operating room can be a burdensome task for circulating nurses because of manual input within the electronic medical record. This can lead to documentation fatigue and contribute to nursing burnout. The aim of this quality improvement project was to design and implement a supply item scanning process and evaluate the effect on intraoperative documentation completion time, room turnover time, picklist documentation accuracy, nurse satisfaction, and burnout. The sample included nine acute care hospitals throughout the United States, with 189 total circulating nurses and 31 718 procedures occurring during the study timeframe of 8 months. Results indicated that nurses were able to complete documentation on average 37.33 minutes sooner, and the operating room turnover time decreased by 1.88 minutes. Although nurses reported that their perceived picklist documentation accuracy did not improve, and the presence of new scanning technology did not influence their hospital employment decision, subjective feedback was mostly positive, with most responses citing the helpfulness of scanning for documentation. This study shows that an interdisciplinary team can effectively work to optimize documentation efficiency and performance improvement using a scanning intervention. Lessons learned through this process can translate into optimizations elsewhere in the electronic medical record.

KEY WORDS: Documentation fatigue, Nursing burnout, Performance improvement, Picklist accuracy, Supply item scanning

T echnology in healthcare has been both a blessing and a curse. Advances in imaging, artificial intelligence, and machine learning have increased information-sharing efficiency between providers. Widespread adoption of these systems and increasing regulatory demands, however, have increased the burden of documentation for nurses with additional workload required to perform daily documentation tasks.[1] Overly burdensome documentation requirements can make an otherwise excellent electronic health record (EHR) system frustrating to use. Inefficient EHRs are linked to provider and nurse burnout.[1,2] Poorly designed and implemented technologies increase documentation times, documentation-related stress, medical errors, clinician burnout, and decreased professional well-being.[1,2]

Previous studies have documented that clinicians spend increasing hours on nonclinical activities.[2] The National Academies of Sciences published a landmark report on clinician burnout in 2019. Specific findings related to the impact of technology on burnout included a lack of meaningful use and integration of documentation systems with other computer systems as key predictors of burnout. They found that enhancing EHR systems by increasing automation, increasing the application of usability principles, and reducing overall nursing time in the chart improved well-being.[2]

BACKGROUND

The efficient use of nurses' time and energy is especially important in the operating room (OR) where literally minutes matter related to the effective use of time and space in a highly technical environment. The perioperative RN circulator is "accountable for the patient outcomes resulting from the nursing care provided during the operative or other invasive procedures in the operating room" including documentation of the materials and supplies used during the operative case.[3] Documenting supply items, such as Surgifoam (Ethicon Inc., Raritan, NJ, USA), Tisseel (Baxter International Inc., Deerfield, IL, USA), and HydroSet (Stryker Corporation, Kalamazoo, MI, USA), is a time-intensive task that creates nursing inefficiencies in the OR. Accurate item documentation is essential for inventory management, surgeon preference card accuracy, and revenue generation. Surgeon preference cards or "picklists" consist of a list of supplies that a surgeon needs to perform their procedure. Improper

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documentation leads to conflicts between inventory managers attempting to lower inventory costs; surgeons, who expect to have all required supplies on hand; and hospitals, who expect to capture revenue related to supply utilization.[4]

Operating room supply utilization in this healthcare system is documented manually in the EHR by typing each item name or by searching and selecting it from an extensive list. Manual documentation extends the time to complete the operative record, often past the procedure end time, causing nurse documentation fatigue and creating throughput inefficiencies.[2,4] Decreasing the documentation burden by scanning supply items may decrease nursing burnout and improve documentation efficiencies, surgical volume, and subsequent revenue generation.

Similar inefficiency issues with EHR systems have been identified, specifically during the perioperative process. Using time-study analysis, researchers found that 40% of the nurses' time was spent on EHR documentation and recommended that EHRs be optimized for their needs during the charting process.[5] Nurse circulators may only leave the OR suite for extra required items or if relieved by another circulating nurse if a procedure is in process. Therefore, if the nurse circulator is not documenting within the electronic chart, they are able to remain more attentive to the surgical procedure.

Scanning is used to facilitate accurate documentation with various areas of the EHR to assist with tasks such as medication administration and laboratory specimen collection to help increase accuracy and reduce the manual documentation burden.[2,4,6] Scanning processes inherently improve usability by reducing the amount of manual hand typing required for documentation and are associated with better cognitive workload and healthcare delivery among nurses. In addition, utilizing a scanning workflow reduces the number of items that need to be opened onto the sterile field at the beginning of a procedure for swift predocumentation due to the efficiencies of real-time scanning, thus reducing surgical waste from unused items and potentially reducing surgical supply costs by up to 13.1%.[4,7] Automating data-input abilities improves software usability and reduces negative emotions induced by work-related information technology use.[6,8,9] Enhancing EHR usability has been shown to lessen documentation time demands, reduce distraction, minimize stress, and enhance charting efficiency.[2]

Finally, a large analysis of all California hospitals over 10 years showed that the cost per minute of an OR suite is $37; thus, any improvement in EHR usability can assist in optimizing room turnover time and reflect on hospital cost savings.[10]

The purpose of this quality improvement project was to reduce the nurse documentation burden by implementing a supply scanning workflow within the main OR procedure area in multiple hospitals within a large US-based hospital system. Specific aims included the design and implementation of the supply scanning workflow and evaluation of the impact of the new workflow on documentation completion time, surgical room turnover time, picklist documentation accuracy, and circulating nurse satisfaction.

METHODS

At the onset of the supply scanning project, the authors conducted a comprehensive literature review to assist in determining available information about OR supply scanning workflow implementation. Global trade item numbers, unique and internationally recognized product identifiers, were uploaded from the inventory control system to the EHR system. Once the hospitals hit a target item upload threshold of 80% of their total items, they were allowed to go live with the scanning workflow. Tandemly, a supply scanning workflow was developed, and nurses were educated on the new process for supply item documentation.

Setting and Sample

The supply scanning workflow was implemented using a popular EHR system at nine hospitals across the United States. This study was reviewed by the University Human Resource Protection Office (STUDY21030162) and was deemed an exempt study. The corporate hospital leadership overseeing OR operations approved the implementation of this project. The project was implemented in a rolling fashion based on each hospital's EHR supply item upload percentage. All nine hospitals were able to take the supply scanning workflow live within 4 months, from May 2022 to August 2022. All cases were included within the sample from 3 months before the first go-live to 3 months after the last go-live. Thus, the study surgical case sample spans from February 2022 to November 2022, totaling 31 718 procedures. A mixture of OR procedure types was included to increase the study's applicability but focused specifically on those occurring within the main OR procedural areas. The sample size also included approximately 189 circulating nurses.

Procedures

The scanning workflow was developed by collaborating with our EHR vendor, corporate nursing informatics, and corporate surgical services departments. This workflow instructs the circulating nurse to scan supply items during surgical suite setup and as extra items are needed intraoperatively. Equipment such as computers, handheld wireless scanners, and EHR system was already in use within the procedural areas. Training occurred via a step-by-step printed guide and demonstrations by our surgical analysts and the nursing informaticist (Project Subject Matter Expert) utilizing a train-the-trainer model with directors and nurse educators prior to the scanning implementation.

Measurement and Evaluation

On-Time Documentation

Quantitative data were used to evaluate the preimplementation and postimplementation outcomes within the sample group. On-time documentation completion was measured using a report from our EHR documentation data. This report examined the time comparison preintervention and postintervention between signing the intraoperative record and arrival at the postanesthesia care unit. Microsoft Excel 365 (Microsoft Corporation, Redmond, WA, USA) was used to run a repeated-measures t test with two-tailed hypotheses used to assess statistical significance, and Cohen's D was calculated to examine clinical significance.

Room Turnover Time

Quantitative report data were used to evaluate OR turnover time preimplementation and postimplementation of the surgical supply scanning intervention. Turnover time was measured using reported data from our EHR nursing documentation of patient out-of-room time compared with the next patient's in-room time. This report examines the average turnover time for each sample hospital facility and is compiled by Caresyntax (Caresyntax Corporation, Boston, MA, USA), a third-party perioperative data solutions platform. Microsoft Excel 365 was used to run a repeated-measures t test with two-tailed hypotheses to assess statistical significance, and Cohen's D was calculated to examine clinical significance.

Nurse Satisfaction and Picklist Documentation Accuracy

An investigator-developed survey delivered via Qualtrics XM (Qualtrics, Provo, UT) was utilized for nursing sample data collection. These data included the employee's hospital location, age, sex, years worked at the location, and education level. Embedded within the survey, we utilized the publicly available and evidence-based Copenhagen Burnout Inventory (CBI) questionnaire to measure nurse burnout. The CBI measures personal burnout, work-related burnout, and client-related burnout using nineteen 5-point Likert-based questions and was developed by researchers in Denmark for use in the human service job sector. The CBI has shown high reliability (0.85-0.87) and validity in many human service job areas, including healthcare.[11,12] The CBI data were analyzed in IBM SPSS Statistics version 27 (IBM Inc., Armonk, NY, USA) to produce descriptive statistics. Additional investigator questions were added to measure nursing satisfaction with the supply scanning workflow and their perceived improvement in picklist documentation accuracy. These questions were reviewed for content validity with subject matter experts in the OR.

RESULTS

On-Time Documentation

A total of 31 718 surgical procedures occurred during the preintervention and postintervention study timeframe from February to October 31, 2022. The study included all procedure specialties but limited the scope to those within the main ORs.

Circulating nurses completed documentation on average 37.33 minutes sooner postintervention with an SD of 60.9 minutes (Table 1). There was a statistically significant time difference to complete documentation from preintervention to postintervention, and the effect size $d = 0.61$ suggests a moderate to large improvement in on-time documentation compliance.

Room Turnover Time

Turnover time preintervention averaged 28.61 minutes and postimplementation averaged 26.73 minutes. The mean of the difference scores showed a 1.88-minute (SD, 5.28-minute) improvement. This result, however, was not statistically significant ($t_8 = -1.25$, $P = .29$). The effect size of $d = 0.36$

Table 1. On-Time Documentation Completion; Additional Time It Takes for the Circulating Nurse to Sign Documentation After the Patient Is in the Postanesthesia Care Unit (in Minutes)

Hospital	Preintervention		Postintervention		Difference	
1	360.54		192		168.54	
2	24.06		43.902		19.842	
3	8.76		10.38		1.62	
4	26.76		29.64		2.88	
5	83.04		25.806		−57.234	
6	0.595		31.98		31.385	
7	30		34.08		4.08	
8	163.86		73.8		−90.06	
9	94.62		49.8		−44.82	
Mean of the Difference Scores	**Median**	**Range**	**SD**	**t**	**P**	**Cohen's D**
37.33	3.72	188.38	60.92	6.12	<0.001	0.61

Table 2. Average Operating Room Turnover Time From Before and After Implementation (Minutes)

Hospital	Preintervention	Postintervention	Difference
1	26.24	25.93	−0.31
2	29.78	28.61	−1.17
3	39.00	23.20	−15.80
4	27.69	27.06	−0.63
5	19.37	19.74	0.37
6	32.59	32.35	−0.24
7	26.76	26.12	−0.64
8	28.72	30.42	1.70
9	27.37	27.17	−0.20
Average time	28.61	26.73	

Mean of the Difference Scores	SD	t	P	Cohen's D
−1.88	5.28	−1.25	0.29	0.36

suggested a mild-moderate improvement in turnover time (Table 2).

Investigator-Developed Survey

Demographic Information

The descriptive statistics on demographic variables are given in Table 3. Of 189 circulating nurses across nine hospitals surveyed, there were a total of 24 responses, and 15 postsurveys were completed entirely. Participants in the survey ranged from age 27 to 66 years, with the majority being female with an education level ranging from bachelor's to a master's degree. In addition, the participants were in various geographic areas, including Central and Western United States.

Picklist Documentation Accuracy

Using a 5-point Likert scale of (1 = strongly disagree to 5 = strongly agree), participants responded to the following statement: "Surgical supply scanning has made it easier for me to provide a more accurate surgical picklist." Overall perceived picklist accuracy when using supply scanning yielded a mean score of 3.9 (SD, 1) (Table 4).

Nurse Satisfaction and the Copenhagen Burnout Inventory

Nurse satisfaction and basic characteristics of the three CBI scales are shown in Table 4 with descriptive statistics. Questions related to personal burnout show an average score of 39.9 (SD, 26). Questions related to work-related burnout show an average score of 42.6 (SD, 26.5). Client-related burnout data show a mean score of 65.7 (SD, 23) (Table 4).

When asked about the impact of supply scanning on nurse retention, nurses reported that the supply scanning implementation and technology availability have not greatly impacted their decision to remain employed at their current hospital (mean, 2.5 [SD, 1]) (Table 4).

Several repeating themes arose when participants responded to the following open-ended statement: "Overall,

how do you feel about the introduction of surgical supply scanning?" The most common themes included the helpfulness of scanning and optimism about the technology. Some instances of barcodes and/or scanner not working were also reported in this open-ended question.

DISCUSSION

Documentation burden in the EHR is a frequent dissatisfier for healthcare providers, including nurses.[2] In a large healthcare system, nurses felt that entering supply items manually into the picklist was time-consuming as each item number would need to be hand-typed, item searched, and then committed to the chart. This led to an inefficient usability experience for the nurse, missed surgical item documentation, and prolonged surgical room turnover time. The nurses were documenting only those items they had time for during the procedure and then would continue to document afterward; if items were difficult to search, they may be left out

Table 3. Postsurvey RN Demographics (n = 15)

Variable	Group	Frequency	Percent
Age, y	21-29	1	6.7
	30-39	8	53.3
	40-49	3	20.0
	50-59	1	6.7
	60-69	2	13.3
Sex	Male	5	33.3
	Female	10	66.7
Education	Associates	2	13.3
	Bachelors	11	73.3
	Masters	2	13.3
	Doctorate	0	0.0
Experience, y	0 to 4	8	53.3
	5 to 9	6	40.0
	10 to 20	1	6.7

Table 4. Nurse Satisfaction and CBI Responses Postimplementation

Question	Mean (SD)
Perceived picklist accuracy using supply scanning.	3.9 (1)
Employment decision based on supply scanning technology	2.5 (1)
Personal burnout	
How often do you feel tired?	30 (23.5)
How often are you physically exhausted?	35 (24.6)
How often are you emotionally exhausted?	35 (24.6)
How often do you think: "I can't take it anymore"?	51.6 (27.5)
How often do you feel worn out?	35 (22.8)
How often do you feel weak and susceptible to illness?	53.3 (33.2)
Total average score	39.9 (26)
Work-related burnout	
Do you feel worn out at the end of the working day?	33.9 (25.2)
Are you exhausted in the morning at the thought of another day at work?	35.7 (27.2)
Do you feel that every working hour is tiring for you?	50 (25.9)
Do you have enough energy for family and friends during leisure time?	58.9 (23.2)
Is your work emotionally exhausting?	39.3 (30.6)
Does your work frustrate you?	44.6 (28)
Do you feel burned out because of your work?	35.7 (25.4)
Total average score	42.6 (26.5)
Client-related burnout	
Do you find it hard to work with clients?	73.1 (16)
Does it drain your energy to work with clients?	73.1 (18.9)
Do you find it frustrating to work with clients?	78.85 (20)
Do you feel that you give more than you get back when you work with clients?	51.9 (27.9)
Are you tired of working with clients?	71.2 (26.7)
Do you sometimes wonder how long you will be able to continue working with clients?	46.2 (28.6)
Total average score	65.7 (23)

of the list or free-texted, extending the wait time for the next surgical procedure, reducing the picklist documentation accuracy, and creating inefficiencies in surgical room throughput.

In this study, documentation following supply scanning was completed on average 37.3 (SD, 60.9) minutes sooner ($P < .001$). Hospitals 1 and 8 had some procedures with extended surgery to postanesthesia care unit arrival times. These pre-data could have positively affected the results; however, even if outlier data are removed, there was still a significant improvement, with documentation being completed 11 (SD, 28.5) minutes sooner ($P < 0.05$). These skewed data could have been due to the large number of new nurses and nurse travelers who may have been unfamiliar with the EHR system and the turnover in surgical services leadership positions.

Optimizing documentation efficiency reduced OR room turnover time by an average of 1.88 minutes, which could contribute to considerable cost savings. In a large study of more than 300 hospitals in California, researchers noted a $37 per minute cost for OR utilization.[7] Calculated savings using this value and the room turnover time in this project across 21 407 total procedures could have theoretically equated to a potential cost savings of more than US $1.48 million.

Research has shown that healthcare teams spend more time with an EHR system than at the patient's bedside.[2,5,9] This scanning optimization reduces nurses' documentation burden by requiring them to spend less time documenting supply items, potentially allowing them to spend more time attentive to the patient and surgeon needs. Furthermore, we saw a minor perceived improvement in documentation accuracy, which can help ensure a complete surgical picklist and more accurate cost per case and potentially help maintain more up-to-date surgeon preference card. Additional efficiencies may be gained by combining the scanning solution with software that automatically updates surgeons' procedural preference cards based on item utilization. This technology was implemented as part of this project initiative. Similar accuracy and efficiency outcomes due to scanning were observed in other scanning-related studies.[6]

Previous research has shown that EHRs can increase nurse satisfaction if implemented correctly; however, nursing workflow inefficiencies, job-related stress, and burnout can also be related to these new systems.[1,2,8] In this study, implementing surgical supply item scanning reduced manual data entry. Nurses reported that supply item scanning created a better OR flow, reduced manual documentation, and reduced barriers to accurate supply item documentation when the barcodes could be scanned properly. Subjective nurse satisfaction survey feedback on the overall experience and accuracy of the scanning workflow showed key themes of the helpfulness of scanning and optimism about the use; however, other themes showed that some barcodes were not working, and some scanners were not working. Because hospitals were allowed to go live with scanning when their item upload percentage was 80%, it could be that those last 20% of items caused most scanning issues.

Circulating nurse burnout scores in this study were relatively high for personal, work-related, and client-related burnout when compared with previous CBI studies. One study examined 1679 academic healthcare employees at a midsized academic teaching hospital and found similarly increased levels of burnout in the areas of personal burnout and work burnout. Their patient-burnout scores were similar to the original study, which examined client-related factors, where clients were considered patients.[12] Compounding factors such as COVID-19, nursing shortages, and the

increased use of travel nurses may have affected these survey results. It may also be possible that nursing staff misunderstood the client-related burnout questions. In this system, the term "clients" usually refers to surgeons and not "patients," which may have led to higher-than-expected results. Although our data indicated high burnout scores, it is difficult to pinpoint if they result from scanning alone. However, reducing documentation fatigue through easier documentation could reduce work-related burnout scores for circulating nurses. Optimizing the EHR for a seamless nursing workflow is critical for ensuring a satisfied workforce and safe patient care.

Limitations of the Study

Although this study showed improvements in documentation efficiency, a limited number of respondents fully completed the postsurvey, which impeded the use of stronger statistical analysis of burnout. Despite considerable initial participant interest, the COVID-19 pandemic and subsequent nursing turnover resulted in many participants leaving their positions during the study period.

Technical issues were noted throughout the staggered implementation timeline. Errors occurred when uploading global trade item numbers from the inventory control system to the EHR. This resulted in slow adoption rates of the supply scanning workflow. A potential impact on user experiences and workflow outcomes could have stemmed from the 80% item upload threshold. Although most items should scan at this point, if the last 20% of items were commonly used, this could degrade the nurse user experience and lead to frustration.

Although this implementation experience is limited to this hospital system, the fundamental benefits of reducing manual documentation by implementing intraoperative supply scanning are generalizable and beneficial to improving the nursing documentation experience.[1,2,9,13]

CONCLUSION

This study demonstrated that an interdisciplinary team of nurses, analysts, and informaticists could work together to optimize nursing documentation within the OR. The improvements showed that less time and effort are needed to document surgical supply items accurately and that having a thorough and accurate surgeon picklist is essential for ensuring a safe and time-efficient surgical process for patients while optimizing surgical room time and cost savings. Nurses noted improvements in the time to complete the surgical item picklist when the functionality worked properly. Additional

areas for research include how scanning affects charge capture and revenue generation, how scanning and the use of intelligent picklist update automation software can improve the accuracy of surgeon preference cards, and how burnout is affected by each one of these technology implementations. Lessons learned for implementing scanning interventions within the main OR can be translated into optimizations elsewhere in the EHR and nursing documentation practices.

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