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Pathways to Quality: Nurse Work Environment, Unfinished Nursing Care, Job Satisfaction, and The Electronic Health Record

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ABSTRACT

Better nurse work environments are associated with patient and nurse outcomes reflecting nursing care quality. Mechanisms through which the work environment influences nursing care quality are not well documented. Unfinished nursing care, electronic health records, and job satisfaction may be involved. Clear mechanistic pathways that explain how these variables might interact to influence care quality are lacking. The aim of this study was to examine how satisfaction with the electronic health record, unfinished care, the work environment, and job satisfaction collectively affect nursing care quality. A secondary analysis of cross-sectional data was performed using survey data collected from inpatient hospital staff nurses in a single U.S. state. Survey responses (n=916) were analyzed using bivariate correlations and path analysis. Moderate bivariate correlations were documented among all study variables. However, smaller effects were identified in the full path analysis model. The nurse work environment had direct and indirect effects (through unfinished nursing care and job satisfaction) on nursing care quality. Satisfaction with the electronic health records affected nursing care quality indirectly through an inverse relationship with unfinished nursing care. Unfinished nursing care and job satisfaction are key mechanisms through which the nurse work environment impacts care quality. More research is needed to better understand the mechanisms through which the electronic health record influences the nurse work environment and nursing care quality are needed.

Keywords: nursing care quality; electronic health record; missed nursing care; unfinished nursing care; nurse work environment

INTRODUCTION

Recent quality reports (AHRQ, 2021) indicate that while improvement is evident in some areas, quality benchmarks are not consistently met. Many indicators remain unchanged, and some are even trending away from benchmark targets. Thus, there is an ongoing need for quality assessment and research into key drivers of quality. The nurse work environment (NWE) was identified as a key driver of quality in the landmark report Keeping Patients Safe: Transforming the Work Environment of Nurses (IOM, 2004). In the subsequent two decades researchers have generated a large body of evidence indicating that better NWEs, generally characterized by attributes such as supportive management, adequate nurse staffing and resources, and nurse involvement with hospital affairs, are associated with improved quality outcomes for nurses and patients (Lake et al., 2019; Swiger et al., 2018; Wei, Sewell, Woody, & Rose., 2018).

Patients receive care from multiple providers across multiple disciplines in organizations with variation in care processes and structural supports. Therefore, quality assessment frameworks depict quality outcomes as the result of multicausal pathways involving interactions among organizational structures, care processes, patients, and providers (Boyle & Baernholdt, 2021). The nurse work environment represents a constellation of structures of care which potentially have direct and indirect effects on quality outcomes (Lake et al., 2020). Despite the established association between this important structure of care, little is known about specific mechanisms through which the nurse work

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environment impacts quality outcomes. Efforts to identify specific pathways connecting the nurse work environment to quality outcomes is now underway (Bai, 2016; Lake, French, O'Roarke, & Sanders, 2020; Liu et al., 2018; Smith, Morin, Wallace & Lake, 2018). We seek to build on this work by examining potential pathways to quality involving the nurse work environment (NWE), and three presumably related aspects of the care delivery system: unfinished nursing care (UNC), the electronic health record (EHR), and job satisfaction (JS).

Unfinished Nursing Care

Unfinished nursing care (UNC), also known as missed care, is a prevalent healthcare issue worldwide. Published reports suggest that 55-98% of nurses report leaving one or more elements of care unfinished and the mean number of care elements left undone ranges from 2-22 (Jones, Hamilton, & Murray, 2015). Lack of human resources is the most frequently cited contributing factor (Blackman et al. 2015; Griffiths et al., 2018; Jones et al., 2015). Evidence suggests that UNC is an important mediator in the relationship between nurse staffing and patient outcomes (Bruyneel et al., 2015). Insuffucient human resources creates time scarcity which reflects a supply-demand imbalance. The time available to care among nursing staff (supply) is insufficient to complete all elements of care required to meet patient needs and expectations (demand). The imbalance is potentially resolved through increasing supply and/or decreasing demand. While the most obvious approach might be to increase the number of available nurses on each shift, this approach is often criticized due to associated costs. Therefore, much emphasis is placed on increasing the time for care through strategies that eliminate waste and enhance efficiency. Thus, nursing activities have been classified as value-added (direct and indirect care), necessary (documentation), and non-value-added or waste (hunting for and gathering supplies) (Storfjell, Ohlson, Omoike, Fitzpatrick, & Wetasin, 2009; Thompson, Johnston, & Spur, 2009; Upenieks, Akhavan, & Kotlerman, 2008). Advocates of this approach encourage transformations in workflows and care processes that shift nursing time toward value-added activities and away from activities in the other categories (Storfjell et al., 2009; Upenieks et al., 2008).

Electronic Health Record Systems

Time-use studies suggest that nurses spend as much as 35% of their work time on documentation (Lavander, Meriläinen, & Turkki, 2016; O'Brien, Weaver, Settergren, Hook, & Ivory, 2015). Thus, documentation burden encroaches on time for value-added activities. Enhanced efficiency of documentation is highlighted as a potential benefit of electronic health record (EHR) systems and may offer a time-saving opportunity for nurses (Campanella et al., 2016; Thompson et al., 2009). the adoption of EHRs also may produce safer and higher quality care through other related mechanisms, including embedding evidence-based practice standards into nurse workflows and facilitating communication within the healthcare team (Kutney-Lee, Sloane, Bowles, Burns, & Aiken, 2019; Thompson, 2009; Walker-Czyz, 2016). These mechanisms may reduce reliance on nurse memory and decrease the likelihood of UNC related to lack of knowledge or forgetfulness. In light of the potential benefits on quality and safety, legislative agendas pushed for rapid and widespread adoption of EHRs. For example, the US government provided significant financial incentives for healthcare organizations to adopt EHRs within aggressive timelines (American Recovery and Reinvestment Act, 2009; Harmon, Adams, & Davis, 2020). The legislative push was effective and today most US healthcare organizations have adopted some level of a basic EHR system (Adler-Milstein et al., 2017). However, little is known about the extent to which the promise of EHRs has been fulfilled.

Some evidence suggests that facets of the EHR may offset any data-entry efficiencies and cause adverse effects that ultimately decrease patient care quality and user satisfaction. Reported adverse consequences include unfavorable changes in workflows, generation of new types of errors, added clinician workload, over-dependence on technology, conflicts between paper-based and electronic systems, suboptimal usability/design for nursing, and decreased and/or miscommunications (Campbell, Sittig, Ash, Guappone, & Dykstra, 2006; Jones, 2011; Harmon et al, 2020; Melnick et al., 2021). The volume of data now integrated into the EHR is formidable and can appear chaotic rather than organized (Padden, 2019). Moreover, safety features within the EHR generate even more information and potential workflow disruption with alerts and alarms (Padden, 2019). If these functions are not managed appropriately, they can introduce inefficiency as nurses expend time attending to excessive false alarms. Alternatively, nurses may become desensitized to the alarms, experience alarm fatigue, and fail to respond to patient needs expediently (Padden, 2019). These facets of the EHR collectively may increase cognitive burden among nurses which may ultimately slow cognitive processing and work productivity. These unintended consequences also impact end-user job satisfaction and have been associated with staff turnover (Walker-Czyz, 2016). It is imperative that strategies designed to minimizeunintended consequences guide EHR implementation, and that user satisfaction is evaluated throughout the implementation and post-implementation processes.

Qualitative study findings suggest that perceptions of documentation burden and cognitive workload have increased (Harmon et al., 2020; Ross, 2020). Quantitative studies to evaluate electronic documentation burden and cognitive overload are lacking. Most studies evaluating the impact of EHRs on documentation burden focus on the

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physician experience (Baumann, Baker, Elshaug, 2018; Harmon et al., 2020). In a recent review of the impact of EHRs on clinical documentation time, findings based on pooled estimates suggest that documentation time actually increased post EHR implementation by 12% for physicians and by 14% for nurses (Bauman et al. 2018). Schenck et al (2018) found an increase in observed nurse documentation time following adoption of EHRs but to a lesser extent (2.7%). Schenck et al (2018) also found that after adoption of the EHR, nurses spent significantly more time in patient rooms, were able to complete more interventions per hour and changed locations fewer times per hour. Additionally, in the post implementation period, nurses spent more time on medication administration, managing infection prevention precautions, assessing coping strategies, and providing emotional support. In contrast, nurses spent less time explaining the patient's condition to patients and/or families and monitoring patient lab results. The nurses in this study also were asked to rate caring efficacy and reported a small but significant decrease in perceived caring efficacy after implementation of the EHR (Schneck et al., 2018). These findings suggest that the EHR affected nurse use of time in both positive and negative ways. To date, only one study directly examined the effect of EHR implementation on UNC. Bail et al (2020) found that nurses spent more time at the bedside and nurse perceived UNC decreased following EHR implementation. No differences were noted in time spent on direct versus indirect care, time for hunting and gathering supplies and equipment, or time on system-related care. An important factor that may contribute to the inconclusive findings investigating the benefits and detriments of the EHR is the difference in the NWEs within which EHR systems are implemented. There is limited evidence on how the NWE impacts the usability and effectiveness of EHR systems and nurse satisfaction with the EHR. Sociotechnical theory suggests that the context of care delivery and the individuals providing the care must be considered in the design and implementation of EHR systems (Kutney-Lee et al., 2019). The net effect of EHR adoption on quality of care, including UNC, warrants further evaluation. Presumably, nurses are more satisfied with EHRs when they are implemented in ways that improve the NWE and generate more time for value-added activities.

Job Satisfaction

Common models of JS such as the Herzberg two-factor model point to work conditions as key drivers of JS (Sangeev & Surya, 2016; Zangaro & Soeken, 2007). Extrinsic work conditions include the physical environment and operating environment which reflect resources, workload, monetary rewards, professional status, and relationships with supervisors and peers. Intrinsic work conditions include independence, autonomy, and potential for growth and achievement. In a recent systematic review (Yasin, Kerr, Wong & Belanger, 2020), 19 studies reported significant associations between external factors and nurse JS. In addition, 14 studies reported significant associations between intrinsic factors and nurse JS. The NWE is a reflection of these work conditions and therefore is also associated with JS. The path from JS to quality outcomes is likely related to the effects of JS on work performance (Spence & Leiter, 2006; Wang, Chou, & Lai, 2018). Wang et al. (2018) suggest that JS is a crucial indicator of nursing performance and that satisfied nurses are more likely to be committed to organizational culture and quality goals. Thus, they hypothesized that satisfied nurses are more attentive to the needs and safety concerns of patients. Using structural equation modeling with cross-sectional survey data they examined the direct effect of one aspect of the NWE (work conditions consistent with a total quality management leadership approach) and the mediating effect of JS on patient safety culture attitude. Both pathways were significant. Spence & Leiter also demonstrated that work engagement had a mediating effect on the relationship between the NWE and patient safety. They surmised that when nurses perceive that work conditions support professional practice thay are more likely to be engaged in their work and ensure safe patient care. These findings suggest that JS may be an important mechanism through which the NWE impacts care quality.

Purpose

Current evidence suggests that nursing care quality is affected by the NWE through pathways that may involve UNC, EHR implementation, and JS. It is important to examine the collective effects and interdependencies of these quality drivers to gain a better understanding of how the environment of care affects the quality of care. The purpose of this study was to examine how the NWE, UNC, the EHR, and JS collectively affect nursing care quality.

METHOD

This study was reviewed and approved by the institutional review board at the University of Alabama at Birmingham. A secondary data analysis was performed using data collected from the Alabama Hospital Staff Nurse Study conducted from July 2018 to January 2019 (Anusiewicz, Fifolt, Montgomery, & Patrician, 2021). Postcards with a Qualtrics survey weblink were mailed to all nurses licensed by the Alabama Board of Nursing (~59,000). A total of 1,345 surveys were returned by the target population (inpatient staff nurses). Surveys with incomplete data (n=436) were excluded resulting in a final sample of 916 inpatient staff nurse respondents. Study variables were assessed using a combination of established self-report instruments and single items compiled into an electronic survey. Demographic

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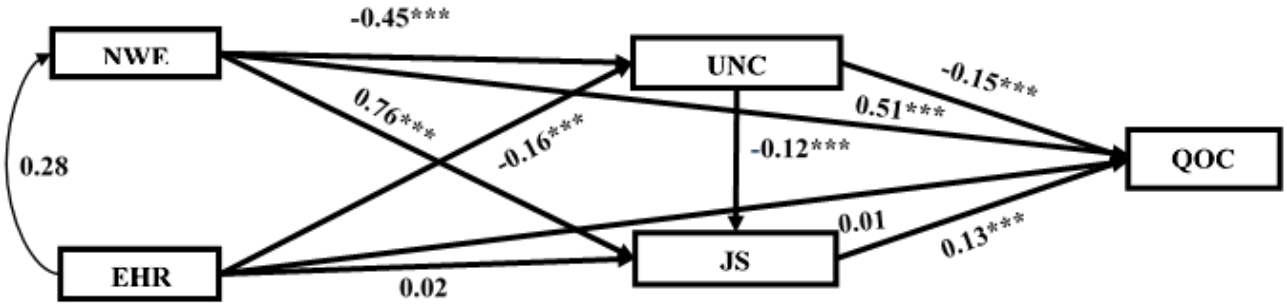
characteristics were assessed using single items for gender, education, ethnicity, primary shift, and unit type. The outcome variable, Nursing Care Quality, was assessed using a single item using a four-point response scale (poor=1, fair=2, good=3, excellent= 4). The NWE was assessed using the Practice Environment Scale of the Nursing Work Index (PES-NWI) (Lake, 2002). The PES-NWI is a 31-item instrument with a four-point response scale (1=strongly disagree and 4=strongly agree). The PES-NWI includes five subscales: 1) Nurse Participation in Hospital Affairs (9 items); 2) Nursing Foundations for Quality of Care (10 items); 3) Nurse Managers Ability, Leadership, and Support of Nurses (5 items); 4) Staffing and Resource Adequacy (4 items); and 5) Collegial Nurse-Physician Relations (3 items). Subscale scores are computed as the mean for all items in the subscale and the composite score is the mean of subscale scores. Higher scores indicate a more favorable work environment. Reliability of the PES-NWI is well-established (Lake, 2002; Zangaro & Jones, 2019). UNC was assessed using the Perceived Implicit Rationing of Nursing Care (PIRNCA) inventory (Jones, 2014). The PIRNCA is a 31-item inventory of nursing care activities. Respondents estimate the frequency in which each activity was not completed when indicated over the previous seven shifts using a five-point response scale (0=not a needed/not applicable; 1=never; 2=rarely; 3=sometimes; 4=often). The composite score is computed as the mean across all items. Acceptable construct and concurrent validity and reliability (Cronbach's alpha of 0.97) for are documented (Jones, 2014).

Nurse satisfaction with the EHR was assessed using a subset of 15 items from the Electronic Health Record Nurse Satisfaction (EHRNS) instrument (Sockolow et al., 2011). Items on the instrument inquire about EHR design, usability, availability, and facilitation of communication among team members. The instrument is scored on a 6-point response scale (0=strong dissatisfaction and 5=high satisfaction). Item scores of 0 to 2.5 indicate dissatisfaction, scores of 2.5 to 3.5 indicate neither satisfaction nor dissatisfaction, and scores of 3.5 to 5 indicates satisfaction (Sockolow, Bowles, Adelsberger, Chittams, & Liao, 2014a; Sockolow, Bowles, Adelsberger, Chittams, & Liao, 2014b). The mean across all items reflects a composite indicator of overall satisfaction or dissatisfaction (Sockolow, Weiner, Bowles, & Lehmann, 2011). Exploratory factor analysis of the 15-item subset was completed and a single factor solution explaining 45.9% of the variance with a Cronbach alpha of 0.88 was confirmed. Therefore, a composite score was computed as the mean across the 15 items. Job satisfaction was assessed using a single item with a four-point response scale (very dissatisfied, moderately dissatisfied, moderately satisfied, and very satisfied). Bivariate correlations were performed to assess associations between study variables and guide variable selection for path analysis. Path analysis was applied to examine hypothesized direct pathways to quality of care from the NWE and satisfaction with the EHR and indirect pathways to quality of care involving UNC and JS (Figure 1). This model was based on conceptual relevance, and previous literature (Campbell et al., 2020; Jones, Drach-Zahavy, Amorim-Lopes, & Willis, 2020; Koy, Yunibhand, Angsuroch, Turale, & Ronjnawee, 2019). All statistical analyses were performed in SPSS Version 25 and R software version 1.4.1717 using lavaan package (Rosseel, 2012).



***p<0.0001, NWE=Practice Environment Scale of the Nursing Work Index (nurse work environment); EHR=Electronic Health Record Nurse Satisfaction; UNC=unfinished nursing care; QOC=nursing care quality; JS=job satisfaction

Figure 1. Hypothesized Model and Results from the Final Path Model

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RESULT

Descriptive statistics are summarized in Table 1. Most respondents were female (87.7%), white (79.4%), and held a Baccalaureate degree in nursing (54.0%). The majority worked full-time on day shift (60.8%) and primarily on a medical-surgical unit (43.4%). Mean composite scores for UNC and satisfaction with the EHR were 1.9 (SD=0.83) and 3.1 (SD=0.88), respectively. Notably, 65% of nurses reported dissatisfaction with the EHR. Nurses were most satisfied with the consistent availability of the EHR (M=3.9, SD=1.2, range=0-5).

Table 1. Descriptive Statistics of the Sample and Main Analysis Variables (N=835-950)

Characteristics/Study Variables	Frequency	Percentage
Gender		
Female	803	87.7
Male	91	9.9
Prefer not to disclose	22	2.4
Race		
American Indian or Alaska Native	8	0.9
Asian/ Pacific Islander	13	1.4
African American	96	10.5
Hispanic	21	2.3
White	725	79.4
Other	13	1.4
Prefer not to disclose	37	4.1
Education		
Diploma	23	2.5
Associate degree	284	31.0
Baccalaureate degree	494	54.0
Graduate (Master, DNP, PhD)	101	11.1
Prefer not to disclose	10	1.1
Other	3	0.3
Shift Type		
Day	556	60.8
Night	296	32.4
Evening	8	0.9
Combination	54	5.9
Unit Type		
Med & Surg	394	43.3
Intensive Care	296	32.5
Others	220	24.2
Characteristics/Study Variables	**Mean**	**Standard deviation**
Age	40.2	(13.4)
UNC	1.9	(0.8)
EHRNS	3.1	(0.9)
NWE	2.83	(0.62)
Job Satisfaction	2.78	(0.84)
Quality of Care	3.16	(0.75)
Experience		
Years as RN	12.5	(11.5)
Years in Hospital	8.0	(8.6)

Note: NWE=Nurse Work Environment; EHRS= Electronic Health Record Satisfaction; UNC= Unfinished Nursing Care. Percentages were calculated from valid responses only (missing were excluded); therefore, the totals do not always sum to 100%.

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Findings from bivariate correlations (Table 2) supported moderate to strong associations between study variables (Cohen, 1988). Importantly, all hypothesized independent variables were associated with quality of care and the strongest association was between the NWE and quality of care (r=0.60). Therefore, we proceeded with path analysis.

Table 2. Bivariate Correlations for the Variables within the Path Analysis Model (N=916)

	QOC	NWE	EHR	UNC	JS
QOC		0.60**	0.34**	-0.40**	0.48**
NWE			.51**	-0.43	0.62**
EHR				0.34**	0.35**
UNC					-0.36**

** p<0.01; NWE=nurse work environment; EHR=electronic health record; UNC=unfinished nursing care; QOC=quality of care; JS=job satisfaction

The final path analysis model is depicted in Figure 1. The NWE had the largest direct effect on nursing care quality (standardized coefficient=0.51). Smaller direct effects on quality of care were supported for UNC (standardized coefficient=-0.15) and JS (standardized coefficient=0.13). Moreover, the NWE had moderate to strong direct effects on UNC (standardized coefficient=-0.45) and JS (standardized coefficient=0.76). Thus, the NWE influences quality of care directly and through pathways involving UNC and JS. Direct, indirect, and total effects of the NWE and satisfaction with the EHR on quality of care are summarized in Table 3. The path from the NWE through JS had a larger total effect on quality (total standardized coefficient=0.61) than the path through UNC (total standardized coefficient=0.58). Nurse satisfaction with the EHR did not produce a significant direct effect on quality of care (standardized coefficient=0.02) or JS (standardized coefficient=0.02). However, satisfaction with the EHR did have a small direct inverse effect on UNC (standardized coefficient=-0.16). The comparative fit index had a value of 1.0, meeting the criteria of 0.95 or greater (Tabachnick & Fidell, 2013). The model also produced a root mean square error of 0.00, meeting the criteria of less than 0.06 (Tabachnick & Fidell, 2013). The model was a saturated fit with no latent variables.

Table 3. Standardized Direct, Indirect, and Total Effects of the Path Analysis (N =916)

Predictor	Mediator	Outcome	Direct	Indirect	Total
NWE	UNC	QOC	0.51***	0.068***	0.578***
NWE	JS	QOC	0.51***	0.099***	0.609***
EHR	UNC	QOC	0.01	0.024***	0.034
EHR	JS	QOC	0.01	0.003	0.013
UNC	JS	QOC	-0.15***	-0.016**	-0.166***

** p<0.01, ***p<0.0001 NWE=nurse work environment; EHR=electronic health record; UNC=unfinished nursing care; QOC=quality of care; JS=job satisfaction

DISCUSSION

Our findings demonstrate that the NWE influences care quality directly and indirectly through other pathways involving UNC and JS. These findings are consistent with previous reports (Bai, 2015; Duffy, Culp, & Padrutt, 2018; Nascimento & Jesus, 2020). Notably, the direct effect of the NWE on care quality was much stronger than the indirect effects through UNC and JS. This suggests that the relationship between the NWE and care quality is not fully mediated by UNC and JS and that other unmeasured and unanalyzed pathways are likely at play. Moreover, the strength of association between these mediating variables and care quality were reduced when the effects of the NWE were controlled for in the path analysis. Our findings also support the NWE as a key predictor of UNC. The strength and direction of association between the NWE and UNC in this study are consistent with previous studies (Duffy, Culp, & Padrutt, 2018; Smith et al., 2018; Smith, Lapkin, Sim, & Halcomb, 2020). Collectively, these findings underscore the relative importance of the impact of the NWE on care quality and highlight potential measurement issues. We used the composite score of the PES-NWI as a measure of the NWE in bivariate and path analyses. Therefore, the effects of specific aspects of the NWE captured by the subscales were not isolated and examined.

Use of the composite score as an overarching measure of the NWE was supported by Lake (2002) based on factor loadings during psychometric analysis. However, Lake also noted shared variance (22%-43%) among the subscales reflecting modest conceptual uniqueness. Moreover, Lake reported that only 20-40% of the variance for each subscale could be interpreted independently of the other subscales. This highlights the interdependence of the various

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components of the NWE and the subsequent challenges in isolating specific mechanisms through which the NWE affects care quality. The variable contributions of each of the PES-NWI subscales on quality of care, UNC, and JS have been previously examined. While the contribution of each subscale varies across studies, the subscale with the most consistent and often the strongest effect on the quality and safety of care is adequacy of staffing and resources (Alenius et al., 2014; Anzai et al., 2013; Friese, 2005; Mihdawi, Al-Amer, Randall, & Afaneh., 2020; Smith et al., 2020; Zuniga et al., 2015). Similarly, while all the PES-NWI subscales demonstrate some level of association with UNC, staffing and resource adequacy is consistently the strongest predictor of UNC (Campbell et al., 2020; Gurkova, Bartonikova, Mikosova, 2021; Park et al., 2018; Smith et al, 2020). The strength of association between each of the PES-NWI subscales and JS are similar with no single subscale emerging as a consistently dominant driver of JS (Alenazy, Dettrick, Keogh, 2021; Manojlovich & Laschinger, 2007).

Our findings related to satisfaction with the EHR also support the significant impact of the NWE on care quality and highlight additional measurement issues. Satisfaction with the EHR was associated with the NWE, UNC, JS, and care quality in bivariate analyses. However, satisfaction with the EHR did not have a significant direct effect on care quality or JS in the path analysis when controlling for the effects of the NWE. The only significant pathway linking satisfaction with the EHR to care quality involved a small inverse effect on UNC. No previous studies examining these relationships were identified. In this study, satisfaction with the EHR was operationalized as a separate and distinct variable from the NWE. Given the embeddedness of the EHR in the NWE, it might be better to conceptualize and operationalize aspects of the EHR as a component of the NWE. The EHR is a type of resource and the item with the lowest rating on the EHRNS instrument in this study was nurse involvement with the design of the EHR. Thus, satisfaction with the EHR may have been partially captured in PES-NWI subscales such as staffing and resource adequacy and participation in hospital affairs. In this context, the EHR effect would be absorbed in the NWE effect. This highlights the interdependency between the EHR and the NWE and supports previous findings which indicate that the work environment plays a significant role in how nurses rate the usability of the EHR and whether EHRs have their intended effects on quality of care and patient safety (Kutney-Lee et al., 2019). In this study, only 35% of the nurses were satisfied with their respective EHRs, which suggests that there are many opportunities for improvement in how EHRs can be redesigned. In attempt to isolate the effects of the EHR within the NWE, Moorer et al. (2009) developed and added a separate subscale, the Nursing Information Technology subscale, to the PES-NWI. The five-item subscale was evaluated using multi-trait scaling analysis which supported convergent and discriminant validity and internal consistency reliability. The shared variance with the other PES-NWI subscales was not reported and no assessment of the conceptual uniqueness of the subscale was offered. The effects of the Nursing Information Technology subscale on care quality, UNC, and JS have not been evaluated.

Collectively, our findings point to staffing and resource adequacy as a major driver of the NWE effect on quality. Importantly, the staffing and resources adequacy subscale score is consistently among the lowest compared to the other subscales on the PES-NWI (Anzai et al., 2013; Campbell et al., 2020; Friese, 2005; Mihdawi et al., 2020; Smith et al., 2020; Zuniga et al., 2015). Given the documented shared variance across PES-NWI subscales, it is likely that the adequacy of staffing and other resources also affects other aspects of the practice environment. Staffing, resources (such as the EHR), and teamwork likely work synergistically to impact the prevalence of UNC through influence on the supply-demand equation as described previously. An environment that includes adequate staffing helps ensure that the supply of nurses is sufficient to meet care demands. An environment that includes effective teamwork potentially impacts both sides of the supply-demand equation and enhances work efficiency. When a team works together effectively, supply goes up as team members volunteer to aid colleagues in response to fluctuating care demands. Demand may decrease when teams create efficient workflows and eliminate the waste associated with delays in response times. The documented effect of satisfaction with the EHR on UNC supports previous propositions that when EHRs are implemented in ways that enhance efficiency, nurses can spend more time on value-added activities, such as direct patient care, and meet patient care demands in a timely manner (Boyle et al., 2019; Harmon, 2015).

Findings must be interpreted in the context of study limitations. We used path analysis to distinguish direct from indirect effects and to test the strength of hypothesized patterns of causal relationships. However, causation cannot be concluded from a single cross-sectional survey study. Data were drawn from a single state which could affect generalizability to other nursing populations. Lastly, we did not directly measure documentation burden, cognitive burden, or other unintended consequences of the electronic health record and thus cannot make inferences about these effects.

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CONCLUSION

This study examined the collective effects of important interdependent drivers of nursing care quality and increased our understanding of how they interact to influence quality. One direct path and two indirect paths (working through UNC and JS) linking the NWE to care quality were identified. Additionally, one indirect path (working through UNC) linking EHR satisfaction and care quality was identified. UNC was part of multiple pathways leading to care quality and warrants further attention by researchers and managers. Therefore, we suggest routine assessment and reporting of UNC in practice settings to evaluate staffing effectiveness. More research is needed to better understand the mechanisms through which the EHR influences the NWE and care quality are needed. Therefore, we suggest that future studies of the effects of the NWE on outcomes include the newly developed subscale for Nursing Information Technology and that the effects of all subscales on outcomes are isolated and evaluated.

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