An Organizational Routines Theory of Employee Well-Being: Explaining the Love-Hate Relationship Between Electronic Health Records and Clinicians

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Abstract

We study the problem of clinician well-being, through the lens of burnout, using an alternate source of data—a large, unstructured, publicly available dataset comprising 55,441 reviews written by clinicians on Glassdoor.com from 2012 to 2020. First, we employed topic mining and qualitative coding methods to identify contributing factors to clinician well-being and drew comparisons with electronic health records (EHR), a well-studied yet controversial factor in clinician burnout. Surprisingly, EHR- or IT-related keywords were not prominent in the clinicians' discourse. Instead, routine operations emerged as the most frequently mentioned topic in the pros and cons sections of the reviews. Since routine operational issues are influenced by IT use, we leveraged organizational routines theory and application integration theory to propose a midrange "routines theory of employee well-being" that explains how managing organizational routines through IS can help improve clinician well-being. We tested the proposed theory using econometric models and found that integrating workflow applications significantly enhanced clinician well-being. In contrast, integrating documentation applications did not exhibit a significant impact. Interestingly, we also observed that the effects of integrating workflow and integrating documentation were more pronounced in hospitals with higher ratings of work-life balance or lower patient-to-nurse ratios, highlighting the critical role of staffing levels in driving the impact of EHR integration on clinician well-being. Overall, this is the first study to theorize and unravel the latent, intricate relationship between EHR and clinician burnout, which is moderated by organizational factors such as work-life balance policies and staffing levels.

Keywords: Clinician Burnout, Organizational Routines Theory, Application Integration Theory, Technostress Theory, Well-Being, Glassdoor, Online Reviews

1 Introduction

Clinician burnout and well-being have become national priorities in the US (Murthy, 2022). The potential shortage of physicians is projected to reach 120,000 by 2030 (Heiser, 2019; Shanafelt & Kuriakose, 2023); coupled with the existing gap of over one million nurses (Murthy, 2022), it poses significant threats to national health and economic security. Additionally, clinician turnover and reduced clinical hours are estimated to cost $4.6 billion annually (Han et al., 2019). While various factors can contribute to clinician burnout, electronic

health records (EHRs) have been widely recognized as a factor, particularly due to usability challenges and the documentation burden they impose (Murthy, 2022; NAM, 2019).

Interestingly, the literature on EHRs presents a mixed narrative regarding their impact on clinician well-being. While some studies have examined the negative impact of EHRs on clinician outcomes (Califf, 2022; Greenwood et al., 2019; Srivastava et al., 2022), others indicate that nurses, in particular, are often satisfied with EHR use (Khairat et al., 2020; Zheng et al., 2010). To date, these conflicting findings remain largely unaddressed. Research has identified positive relationships between EHR use and business outcomes such as reduced costs, fewer errors, and improved patient outcomes (Bardhan et al., 2022; Bhargava & Mishra, 2014; Devaraj et al., 2013; Kohli et al., 2012). However, evidence highlights the adverse effects of EHRs on clinician well-being, particularly regarding increased workloads and dissatisfaction (Adler-Milstein et al., 2020; NAM, 2019). Despite the mixed findings, the mechanisms through which EHRs contribute to clinician burnout remain underexplored and researchers have not extensively examined whether the (positive) impacts of EHRs on organizations may be associated with (negative) impacts on clinicians' well-being. Furthermore, there is limited consensus on the contributing factors and their relative importance in influencing clinician well-being (Arnold et al., 2020; Brigham et al., 2018; Carayon et al., 2019; Carayon et al., 2020; NAM, 2019). While EHRs are widely recognized as a significant contributor to clinician burnout due to their usability challenges and documentation burden in practice (Murthy, 2022), there remains a critical research gap in understanding the nuanced relationship between EHRs, clinician satisfaction, and broader well-being outcomes.

To address these knowledge gaps, we adopted an inductive research approach using unstructured data from clinicians (EHR users) to answer three interrelated research questions:

RQ1: What are the contributing factors of clinician well-being, and how does EHR compare in terms of relative importance?

RQ2: What is the relationship between EHR and clinician well-being?

RQ3: What are the mechanisms through which EHR influences clinician well-being?

Within the IS discipline, the positive impact of EHRs on economic indicators such as productivity, quality, cost efficiency, and patient satisfaction is well-established (Bhargava & Mishra, 2014; Devaraj et al., 2013; Kohli et al., 2012). Yet there is a limited understanding of why the adoption of EHRs often causes distress and dissatisfaction among physicians and nurses (henceforth

clinicians). Although behavioral technostress research has primarily focused on end-user job satisfaction at the individual level, the impact of EHRs on clinician well-being at the organizational level is not well understood. The technostress framework has examined factors such as usefulness, technology support, involvement facilitation, work overload, complexity, uncertainty, insecurity, and invasion, and their relationship to employee job satisfaction (Califf et al., 2020; Ragu-Nathan et al., 2008; Tarafdar et al., 2007). However, since EHR adoption and use are intertwined with organizational sourcing and vendor strategies, an organizational-level investigation of the impact of EHRs on clinician well-being, while critical, has been overlooked in the literature.

Furthermore, while the technostress framework explains the direct behavioral relationship between IT artifacts and users, it is constrained in capturing the broader organizational dynamics and unintended consequences of IT use on employee well-being (Tarafdar et al., 2019). This limitation is particularly true for EHRs because their use is federally mandated and their users (i.e. clinicians) are highly skilled professionals, trained to work in high-stress work environments. In addition, technostress constructs such as the IT artifact's usefulness, reliability, complexity, support, or workload often reflect user perceptions but may fail to fully capture the organizational attributes or decisions influencing the mandatory use of EHRs. Therefore, our primary goal is to take an inductive approach to uncover the nuanced factors contributing to clinician well-being and to delve into the EHR-related mechanisms and mitigants that can help organizations improve clinician satisfaction.

Based on the diverse empirical evidence regarding the impact of EHRs, we examine this phenomenon using an alternate and underutilized data source, i.e., publicly available unstructured clinician reviews from Glassdoor, a popular job review website. Clinicians, like other types of employees, use online platforms such as Glassdoor to share qualitative insights into their job experiences, offering a unique opportunity to analyze their well-being from a data-driven perspective. By using this large-scale secondary dataset, we mitigate cognitive biases often associated with surveys and interviews. We collected a total of 55,441 textual reviews written by clinicians (3% physicians, 60% nurses, and 37% other clinicians) over 9 years, from 2012 to 2020. This extensive dataset provides a comprehensive view of clinicians' perspectives on their work environments, EHR use, and well-being, allowing for a more robust understanding of the phenomenon.

Our study followed an inductive research design. First, we utilized a computationally intensive approach (Berente et al., 2019; Miranda et al., 2022), which combined topic mining and qualitative coding techniques to explore contributing factors to clinician

well-being, their longitudinal evolution, and their relative importance (RQ1). Specifically, we analyzed a large unstructured dataset of reviews written by clinicians on Glassdoor, where they evaluated their employing hospitals. This step provides a granular view of potential factors influencing clinician (dis)satisfaction. Our analysis revealed that keywords related to routine operations were the most frequently mentioned themes in clinicians' pros and cons discussions, while IT and EHR-related keywords were surprisingly less prominent. Given that organizational routines are often affected by IT use, we focused on reviews that mentioned routines and IT-related terms for a detailed qualitative analysis. This step uncovered recurring themes and identified routine operational issues that could be mitigated through application integration actions designed to enhance workflow and documentation efficiency in hospitals. Based on these results, we then employed disciplined reflection (Leidner & Gregory, 2024) to develop a midrange theory, termed routines theory of employee well-being (RTW), which helped us theorize the relationship between EHR and clinician well-being (RQ2). Grounded in organizational routines theory and application integration theory, RTW posits that reducing application diversity—an inherent trait of healthcare IT—can streamline organizational routines and improve clinician satisfaction. Specifically, sourcing clinical systems and EHR applications from a single vendor may reduce operational complexity, improve clinical workflows, and positively impact clinician well-being.

Second, we tested our midrange RTW theory to uncover the mechanisms that explain the impact of EHRs on clinician well-being (RQ3). Following Tremblay et al. (2021), we developed hypotheses based on RTW and use multilevel regression models to examine the relationship between routines improvement actions, such as workflow integration (WI) and documentation integration (DI), and their impact on clinician well-being. We found that integrating applications that support workflows (e.g., emergency, laboratory, radiology, and inpatient floors) significantly improved clinician sentiment toward routines, especially for nurses and other clinicians. Contrary to expectations, integrating documentation applications (e.g., physician data repository, order entry, clinical decision support systems) had no significant impact on clinician sentiment toward routines.

Interestingly, our results also suggest a positive moderating effect of work-life balance on the impacts of WI and DI. In particular, hospitals with higher ratings of work-life balance amplify the benefits of WI and also tend to exhibit a positive impact of DI on clinician well-

being. On the other hand, the patient-to-nurse ratio, another organizational factor, demonstrates a negative moderating role by weakening the positive effect of WI and manifesting a negative impact of DI on clinician well-being. Therefore, our results underscore the moderating role of organizational factors, such as work-life balance and staffing levels, in explaining the complex love-hate relationship between EHR systems and clinician burnout. Our findings also imply that EHR systems may not function as a substitute for appropriate staffing levels, thus informing healthcare practitioners that improving performative routines through application integration can mitigate burnout and improve clinician well-being when complemented with strategies to enhance work-life balance and reduce staffing shortages.

Our paper makes several theoretical contributions. First, our midrange RTW reveals the mechanisms through which EHRs impact clinician well-being, addressing a critical gap in the literature. This new theory sheds light on how organizational decisions, such as application integration between and within departments combined with other organizational non-IT factors like work-life balance policies and staffing levels affect clinician well-being at the individual level. Second, our theoretical triangulation in Section 6 demonstrates how RTW relates to and extends organizational routines theory, application integration theory, and technostress theory. Finally, given the growing use of diverse AI applications in healthcare, we anticipate an escalation in burnout among users. Our midrange theory offers a framework to explain and potentially mitigate such unintended consequences.

2 Literature Review

In this section, we present a narrative review of the existing literature on clinician well-being, the evolving trends in EHR use, and how they are related. By doing so, we synthesize relevant lexicons and identify knowledge gaps.

2.1 Clinician Well-Being and EHR

Clinician well-being has emerged as a broad lexicon that includes burnout, job satisfaction, and other related constructs, such as exhaustion, cognitive load, and frustration (Nguyen et al., 2021; Yan et al., 2021). Burnout,[1] an occupational phenomenon, is defined as a syndrome due to chronic workplace stress that has not been successfully managed (WHO, 2019). It is characterized by feelings of energy depletion or exhaustion, increased mental distance from one's job, cynicism or negativity, and reduced professional

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[1] Strain, such as burnout, job dissatisfaction, exhaustion, turnover intention, and cognitive load, is an outcome of stress (Ayyagari et al., 2011)

efficacy (Yan et al., 2021). Longitudinally, burnout is an antecedent to job satisfaction (Cordes & Dougherty, 1993; Wolpin et al., 1991), which, along with other affective, physiological, and behavioral outcomes, contribute to the overall well-being of a person (Lizano, 2015). Within IS, such negative unintended consequences have been examined under the framework of user resistance (Lapointe & Rivard, 2005) and technostress (Ragu-Nathan et al., 2008). While studies have explored factors that cause user resistance and job dissatisfaction due to IT use, there is a growing need to evolve these questions to address how IT use can mitigate technostress and enhance employee well-being (Tarafdar et al., 2019).

Clinician burnout is often attributed to a chronic imbalance between overwhelming job demands (e.g., workload, scheduling, staffing, administrative burden, workflow issues, technology, time, moral distress, and patient factors) and insufficient job resources (e.g., meaning and purpose in work, organizational culture, alignment of values and expectations, flexibility and autonomy, rewards, support, work-life integration) (NAM, 2019). Addressing this systemic problem requires interventions targeting not only technological challenges but also organizational structure and culture (Carayon et al., 2019; Kuehn, 2023; Murthy, 2022; NAM, 2019). For instance, EHRs are widely attributed to clinician burnout due to usability issues and the increasing burden of documentation (Califf, 2022; NAM, 2019). Specific issues include insufficient time for documentation, high volumes of patient messages, and negative perceptions of EHRs among providers (Yan et al., 2021).

The impact of clinician burnout extends beyond physicians to allied health professionals, such as nurses and medical technicians, who also experience EHR-driven burnout (Abelson & Baumgaertner, 2023; Califf, 2022). These professionals are crucial to the care delivery system, and their job demands differ significantly from those of physicians. Thus, understanding their perspectives is crucial, especially considering that EHR use in the US has been federally mandated since 2010 and has significantly disrupted the work environment of both physicians and nurses.

EHRs are clinical IT systems designed to electronically document, store, and manage patient health information, aiming to deliver high-quality, efficient care. By 2018, nearly 96% of hospitals and 85% of physician offices had adopted EHR systems (ONC, 2017). The benefits of EHR adoption are well-documented, including enhanced patient care, quicker access to patient records, automated alerts for medication errors and critical lab values, streamlined test ordering, and improved communication among care teams (Ayabakan et al., 2017; King et al., 2014). However, these systems have

also introduced significant challenges, such as increased workload, extended working hours, and heightened job-related stress compared to traditional paper records (Adler-Milstein et al., 2020).

As such, the implementation, adoption, and use of EHRs create both favorable and unfavorable stressors for clinicians. While much of the existing literature highlights the negative impact of EHR use on clinician well-being (Nguyen et al., 2021; Yan et al., 2021), the evidence is discordant. Some studies show a strong association between poor EHR usability and burnout (Melnick et al., 2020), while others find no significant link (Kroth et al., 2019). A critical gap exists in understanding how organizational-level EHR decisions affect clinician outcomes, as most research has focused narrowly on individual-level factors such as EHR use and their impact on clinicians' psychological responses and perceptions. This discordance may stem from differing research scopes: while individual-level research focuses on stressors like usability and workload, organizational-level studies examine value generation from IT investments. Bridging this gap requires deeper investigation into the unintended consequences of organizational decisions, such as the integration of adopted EHR systems, and their impact on clinician well-being.

2.2 The Dual Nature of EHR: Benefits, Barriers, and Integration Approaches

The paradox in healthcare IT lies in its mixed outcomes. Despite the substantial investments in EHRs for improved productivity, quality, and safety, the realized benefits are often minor, context-dependent, and fail to meet expectations (Wachter & Howell, 2018). Further, gains in efficiency and productivity are frequently negligible, with some studies suggesting that these systems impose new burdens rather than alleviating existing ones. For example, following the 2010 mandate for EHR use, clinicians experienced an increased documentation burden that added to their workload. Even prior to the mandate, EHR adoption had driven some clinicians to leave hospitals implementing these systems (Greenwood et al., 2019). The introduction of quality payment programs (QPPs) under hospital value-based purchasing (HVBP) in 2012 further compounded these issues by requiring more extensive documentation and reporting (O'Shea, 2018). Additionally, the significant financial investment in EHR systems has, in some cases, led to reduced staffing levels for organizations struggling to contain costs (Lu et al., 2018), ultimately increasing clinician workloads and contributing to burnout. This creates a stressful work environment where clinicians are expected to deliver high-quality care while meeting stringent documentation and cost-containment requirements.

Recognizing these challenges, the US government introduced the ONC Burden Report, outlining strategic initiatives to improve EHR interoperability and usability (ONC, 2020). Despite being recognized as a critical factor in reducing clinician stress, achieving interoperability remains a difficult endeavor because healthcare IT applications are inherently diverse and multiple vendors provide distinct platforms (Ayabakan et al., 2017; Bardhan et al., 2022; NAM, 2019). Consequently, providers can mix and match solutions from multiple vendors, while commercial vendors may also bundle several applications. While it has been reported that health systems, on average, operate 18 distinct EHR platforms (Sullivan, 2018), an increasing number of organizations are pursuing application integration by sourcing EHR applications from a single vendor, a strategy known as single-sourcing (Angst et al., 2011, 2017). Single-sourcing offers the advantage of faster interoperability, potentially improving end-user satisfaction (Srivastava et al., 2022) and generating economic value (Ayabakan et al., in press; Bardhan et al., 2022; Wowak et al., 2024).

While EHR integration can streamline workflows and improve interoperability, it may also have unintended consequences. For instance, the one-size-fits-all solutions provided by single vendors may lack the flexibility and functionality to support specialized clinical workflows, forcing clinicians to spend additional time on workarounds (ONC, 2020). This trade-off highlights the complexity of balancing standardization with the unique needs of various healthcare providers. Overall, while application integration and interoperability are seen as solutions to reducing clinician burden and improving well-being, the mechanisms through which these strategies impact clinicians remain underexplored. This research delves into these intricate relationships to provide actionable insights for healthcare organizations and theoretical understanding for researchers.

3 Inductive Theory Development

Digital trace data and online reviews offer valuable opportunities to understand the perspectives of employees and customers (Sharda et al., 2014). In the context of healthcare, analyzing anonymous reviews written by clinicians about their employing hospitals provides a rich source of qualitative insights into their working conditions, job satisfaction, and overall well-being. These reviews provide a large, user-generated dataset that complements traditional methods such as surveys and interviews. Unlike conventional data collection approaches, online reviews mitigate potential biases from self-reporting and structured questioning. They enable researchers to address existing gaps in the understanding of critical issues by uncovering trends and patterns at scale.

To theorize, we adopted an inductive approach that combines topic mining and qualitative coding techniques (Berente et al., 2019). This approach allowed us to analyze a large corpus of 55,441 online reviews from Glassdoor, spanning clinicians' discussions of their experiences. For topic mining, we employed latent Dirichlet allocation (LDA) to convert the unstructured text into a structured, multidimensional numerical matrix representation. This process identified recurring themes and created a dictionary of keywords along with their associated frequencies of occurrence. As a result, we uncovered the latent patterns in clinicians' discussions, revealing underlying factors contributing to their workplace experiences. Once the keywords and themes were extracted, we applied qualitative coding techniques to classify the keywords into higher-order categories. This step involved organizing the identified themes into meaningful constructs, allowing us to capture emerging patterns that explain clinician perceptions and experiences.
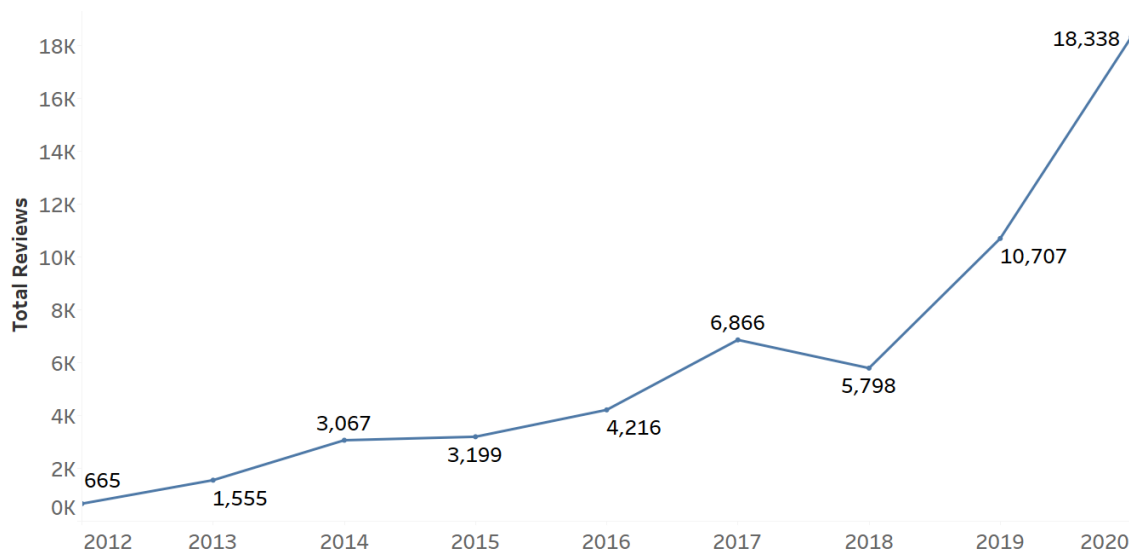
3.1 Glassdoor Website

Launched in 2008, Glassdoor provides a venue for current and former employees to review their employers. Employees must post a review before obtaining complete access to the website, which affords an incentive to share employment information. Glassdoor also implements a stringent policy to prevent companies from self-promotion and alleviates the risk of unrepresentative reviews by using email verification and fraud detection algorithms. Further, the website administrator moderates content through manual follow-up to eliminate invalid reviews (Green et al., 2019). Appendix A Figure A1 shows a representative Glassdoor review, including the employee's overall star rating,[2] textual responses for the pros and cons of working at the focal company, date of review, job title, work location, and tenure.

In recent years, Glassdoor has gained momentum among researchers studying employee satisfaction. It provides an ideal context for our study for several reasons. First, Glassdoor maintains the largest publicly available database in its coverage of healthcare organizations and employee reviews in the US (Ji et al., 2017). Second, Glassdoor data is unique because all users of the job search function need to fill out an employee survey to gain full access, reducing the concerns of "J-shaped" biased distribution in review ratings caused by extreme opinions (Hu et al., 2009).

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[2] It is a composite measure of the reviewer's assessment of work/life balance, culture and values, diversity and inclusion, career opportunities, compensation and benefits, and senior management.

Figure 1. Total Number of Clinician Glassdoor Reviews by Year

Further, Green et al. (2019) observed a positive and significant association between Glassdoor ratings and existing employee satisfaction measurements, indicating the validity of using Glassdoor reviews to measure employee satisfaction. Finally, precisely measuring employee satisfaction at the organizational level is not easy. To the best of our knowledge, Glassdoor is the largest nationwide database that reports job satisfaction for healthcare workers. Glassdoor reviews allowed us to analyze the unstructured texts on pros and cons opinions to understand clinicians' job satisfaction and well-being.

3.2 Methodology

We extracted Glassdoor reviews and metadata for all organizations in the "health care services & hospitals" industry from 2012 to 2020, as there were very few reviews prior to 2012. Figure 1 presents the number of reviews collected across the years. For each review, we obtained the employee job title, hospital web link, star ratings, hospital city, hospital state, hospital type, review text (pros, cons, and advice to management), review date, and employee tenure. We expected that using unstructured clinician reviews would reveal broad aspects of clinician well-being.

One of the co-authors, a domain expert, classified the Glassdoor job titles into four categories: (1) physician, (2) nurse, (3) other clinician, and (4) nonclinical.

Physicians include clinicians with job titles such as doctors, residents, and hospitalists. Nurses include registered nurses, licensed nurses, advanced practice nurses, student nurses, and nurse assistants. Other clinicians include employees in pharmacy, laboratory, radiology, dietetics, and clinical operations. Finally, nonclinical job titles are related to administrative and business roles. [3] Finally, we filtered the corpus to extract 55,441 reviews from clinicians, i.e., physicians (3%), nurses (60%), and other clinicians (37%) over the 9 years of the study period.

We used LDA on term frequency-inverse document frequency (TF-IDF) results to generate a contextual lexicon for clinician well-being. TF-IDF is an effective topic mining method that is easy to understand and computationally efficient (Blei & Lafferty, 2009). While LDA is a generative probabilistic model that can be used to discover hidden topics in a corpus (Blei, 2012), TF-IDF (Salton & Buckley, 1988) is a statistical method for identifying the relative importance of a word for one document compared with the rest of the corpus. In TF-IDF, the weightage of a word increases proportionally with its normalized frequency in the document but decreases if it also appears frequently in the remaining corpus. Thus, using LDA on a pruned vocabulary is well-suited for our research objective of keyword mining and creating a lexicon for clinician job satisfaction (Blei & Lafferty, 2009).[4]

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[3] There are about 20,000 unique job titles. Given the size, we do not report the detailed coding scheme, which is available upon request.

[4] Due to the specialized nature of care delivery, upcoming pretrained deep learning models like BERTopic might not be

effective in discovering rare out-of-vocabulary words. In contrast, TF-IDF permits rare words, absent in a pretrained corpus, to receive non-zero IDF weights.

3.3 Analyses

We performed LDA to examine pros and cons reviews at both hospital and individual levels for multiple iterations until we achieved theoretical saturation (Urquhart, 2022). The output of each iteration was a 10×10 matrix of 10 topics, each with 10 words. We chose $K = 10$ because it gave the most interpretable results in the least number of iterations. The resulting 100 words, each for hospital and individual levels, were included in the stop-words for the next iteration to generate a new matrix of 100 words. We repeated the process 19 times until we achieved our stopping criteria of theoretical saturation, defined as (1) meaningless words appear and (2) no new words appear. We observed that the hospital-level and individual-level topic mining results were qualitatively similar and thus combined them to create a single resultant dictionary, an exhaustive list of all distinct words from the 19 iterations that were qualitatively assessed to be meaningful to the context of clinician well-being. Finally, the resultant dictionary of pros and cons keywords was qualitatively coded into categories by three co-authors with a near-perfect agreement (Fleiss' Kappa of 95.3; disagreements were reconciled).

Next, we ran a year-wise LDA to extract the dominant keywords each year and investigated the longitudinal evolution of topics. We computed a quantitative measure called category index (CI) to examine the relative importance of coded categories. It is calculated as the number of reviews consisting of the keywords in the respective categories, divided by the total number of reviews each year.[5] The resultant ratio CI ranged from 0 to 1, where higher values indicate that more reviews are about a specific category.

3.4 Topic Mining Findings

Tables B1 and B2 in Appendix B illustrate the qualitatively coded categories for the topic mining results from the cons and pros reviews, respectively. The mined keywords can be interpreted as highly frequent and important aspects voiced by clinicians. Thirteen categories were identified for cons and 12 categories for pros, which collectively represented the factors driving clinician well-being. Interestingly, the coded categories were qualitatively similar across the pros and cons reviews. In other words, the factors that satisfied clinicians were often the same as those that dissatisfied them. This alignment supports job satisfaction theories, suggesting that the same factors may satisfy and dissatisfy employees (Ewen et al., 1966). However, this finding may contrast with recent technostress models that posit that different eustress and distress factors affect job satisfaction (Califf et al., 2020; Tarafdar et al., 2019). This

discrepancy could be attributed to the differences in organizational versus individual-level analysis and the use of non-IT versus IT constructs.

Surprisingly, EHR-specific factors, such as usability or documentation burden, did not emerge as prominent contributors to clinician well-being in our topic mining results. Instead, the most frequently occurring themes revolved around routine operations and workflow-related issues. While these issues are related to EHRs, they can also be influenced by other hospital IT systems.

We analyzed year-wise trends (Figures 2 and 3) to examine the evolution of these factors. The results indicate that keywords and categories remained largely consistent across years and between cons and pros reviews. We plotted CI for cons and pros categories to examine longitudinal trends and the relative importance of coded categories. A higher CI value of a category indicated that there were more reviews about this category compared to other categories. For cons reviews in Figure 2, routine aspects, organizational factors, and compensation and benefits emerged as the most dissatisfying dimensions for clinicians, while health and well-being were also notable concerns. In sharp contrast, EHRs and IT factors were comparatively less discussed. For the pros category in Figure 3, routines and workflow factors, again, were prominent contributors to satisfaction, while IT-related factors ranked lower compared to routines and organizational factors.

To examine the role of EHRs in clinician burnout, we focused on IT-related keywords and categories and their relationship to routine operations. Figure 4 presents the CI trends for the key categories, including routine operations and IT-related factors. Both categories exhibited a decreasing trend in terms of their appearance in the cons and pros reviews. These findings answer our RQ1 and indicate that fewer clinician reviews discussed these categories over time. This pattern is consistent with the findings from Sen et al. (2022), who also reported a downward trend in occupational depression, measured using Glassdoor cons reviews data. A plausible explanation for this decline is the increased emphasis on clinician well-being in recent years by researchers and media, and the efforts by hospitals and policymakers to address the issue. Further, the lower frequency of IT-related keywords warrants cautious interpretation. It is possible that clinicians may refrain from voicing (dis)satisfaction with EHRs, as their use is mandatory. Instead, they may focus on factors that could potentially bring changes at the hospital level. On the other hand, EHR, a critical organizational decision, may drive clinician well-being through its indirect effect on organizational routines. Indeed, routine operations frequently appear in both cons and pros reviews. In a

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[5] For example, if there are a total of four "pros" reviews in the year 2012 and only two consist of cafeteria category keywords (frequency)—i.e., Review 1: cafeteria (1), food

(0), food truck (1); Review 2: cafeteria (1), food (5), food truck (0)—then the CI for the pros-cafeteria category for 2012 would be equal to 2/4 = 0.5 or 50%.

scenario where EHR use is mandatory, clinicians' (dis)satisfaction with their daily work environment may reflect the inability of EHR to streamline and improve clinical routines.

Next, we ground these findings back to our data, which begs a follow-up question of whether recent trends in EHR can mitigate routine-related issues and thereby improve clinician satisfaction. To this end, we first theorize the mechanisms linking EHR and clinician well-being in Section 3.5 and then test our theory using econometric models in Section 4.

3.5 Theorizing: Routines Theory of Well-Being

Our topic mining unravels a comprehensive set of factors influencing clinician well-being. Specifically, we highlight four key findings: (1) the contributing factors remained consistent over the 9-year study period; (2) factors that satisfied clinicians also dissatisfied them (Ewen et al., 1966); (3) clinicians expressed more dissatisfaction with routine operational issues, such as staffing, workflow, efficiency, and coordination, than with IT or EHR systems; and (4) since efficiency and effectiveness in hospital routines are influenced by EHR

(Devaraj et al., 2013), the impact of EHR on hospital routines may be an underlying reason why EHR is blamed for poor clinician well-being.

Thus, we posit that clinician burnout may not be directly caused by EHRs per se but may rather be due to their inability to improve hospital routines and streamline workflows, leading to stress and burnout among clinicians. This perspective can be explained through the lens of organizational routines theory, which defines organizational routines as repetitive, recognizable patterns of interdependent actions carried out by multiple actors. These routines have implications for organizational stability and are classified into *ostensive* and *performative* aspects (Feldman & Pentland, 2003).

The ostensive aspect refers to the abstract, generalized idea or script of routines, including formalized rules, procedures, and guidelines intended to guide behavior. It represents organizational members' shared understanding and cognitive schema about how a routine should be performed, providing stability and normative guidance. For example, a hospital's official policy on the triage process in an emergency room (ER) or admission process for an elective admission type, detailing steps and criteria, represents ostensive routines.
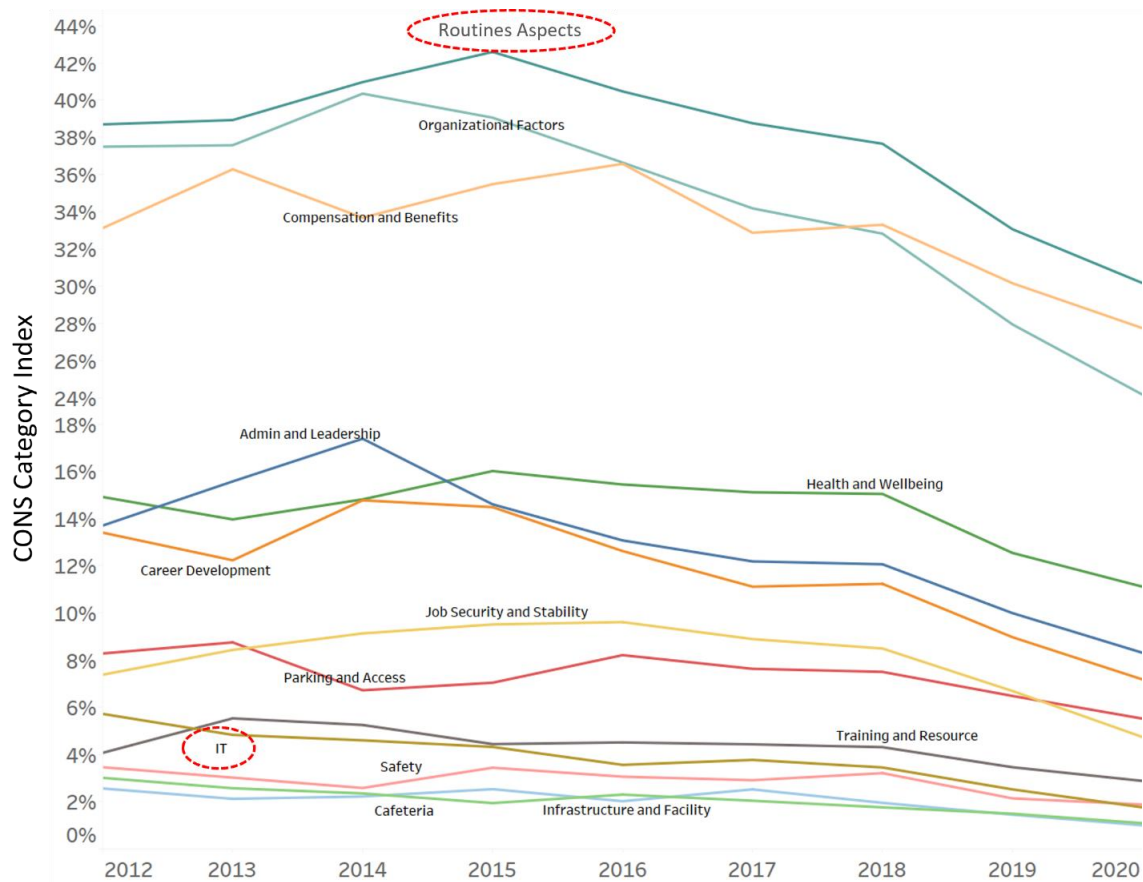
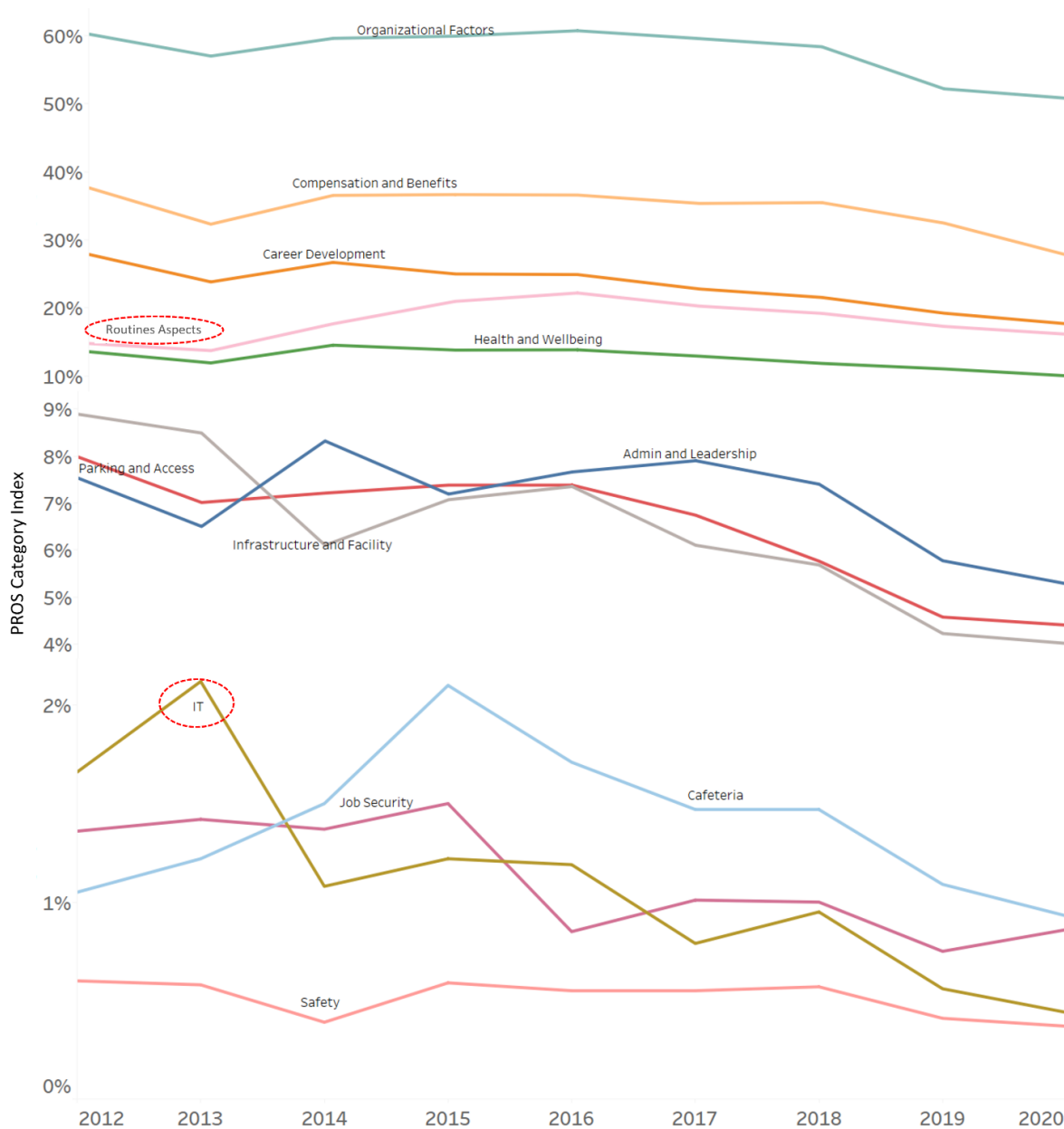

Figure 2. Cons Category Index by Year

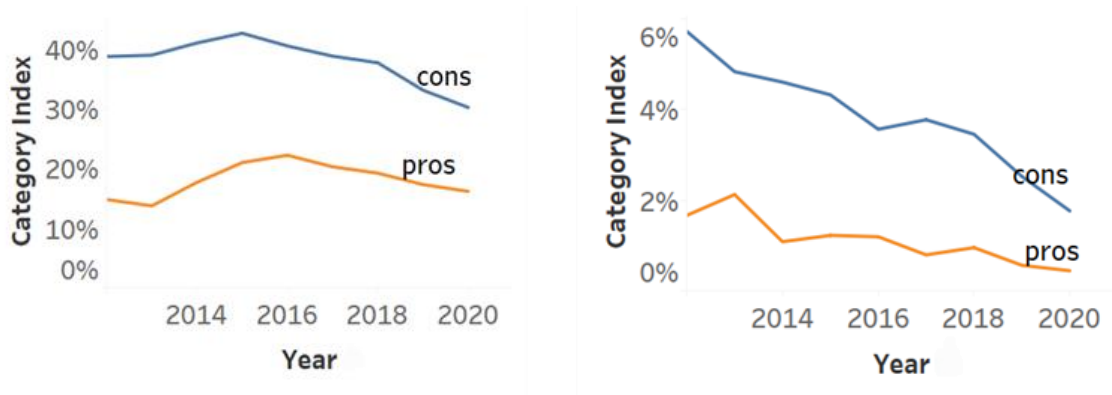**Figure 3. Pros Category Index by Year**

Figure 4. Individual Category Index for Routines and IT by Year

The performative aspect, on the other hand, involves the actual enactment or execution of the routine by individuals. It includes the specific actions and behaviors that occur as the routine is carried out, reflecting real-time adaptations and improvisations. This aspect is dynamic and variable, shaped by the agency of individuals as they interpret and apply the ostensive script in practice. For instance, the actual processes of triaging and managing patients based on real-time conditions in the ER and interactions with other departments represent performative routines.

Both ostensive and performative routines are mutually necessary and, together, capture the complexity and dynamism of organizational routines (Feldman & Pentland, 2003). However, implementation and changes in IT can result in misalignment between ostensive and performative routines, causing unintended consequences such as medication errors, inefficiency, and poor coordination (Novak et al., 2012). The misalignment can be mitigated by identifying the underlying problems and reconciling the ostensive and performative routines through actions such as influencing users' understandings, altering IT features, modifying institutional policies, and improving access to and operation of communication technologies (Orlikowski et al., 1995).

While ostensive routines provide a blueprint for daily activities, performative routines involve actions that can invoke positive or negative sentiment among those carrying them out. However, our current understanding of organizational routines does not consider their impact on agentic well-being and how problem-solving actions affect performative routines as observed through users' reflective perceptions. Understanding routines from the perspective of employee well-being may have similarities with Feldman and Pentland's (2003) discussion on the role of routines in generating power conflicts between managers (dominance) and labor (resistance); however, in the context of mandatory EHR use, clinicians are often required to bear the burden of problematic ostensive routines that may be driven by IT deficiency.

Our analysis of Glassdoor reviews suggests that organizational routines at hospitals are the major contributors to negative sentiment and clinician dissatisfaction. Upon further qualitative exploration of the reviews containing routines-related keywords (Table 1), we theorize that problems with routines could be mitigated by workflow integration and documentation integration, which can improve employee well-being.

Table 1. Routines Aspects and Mitigation Strategy

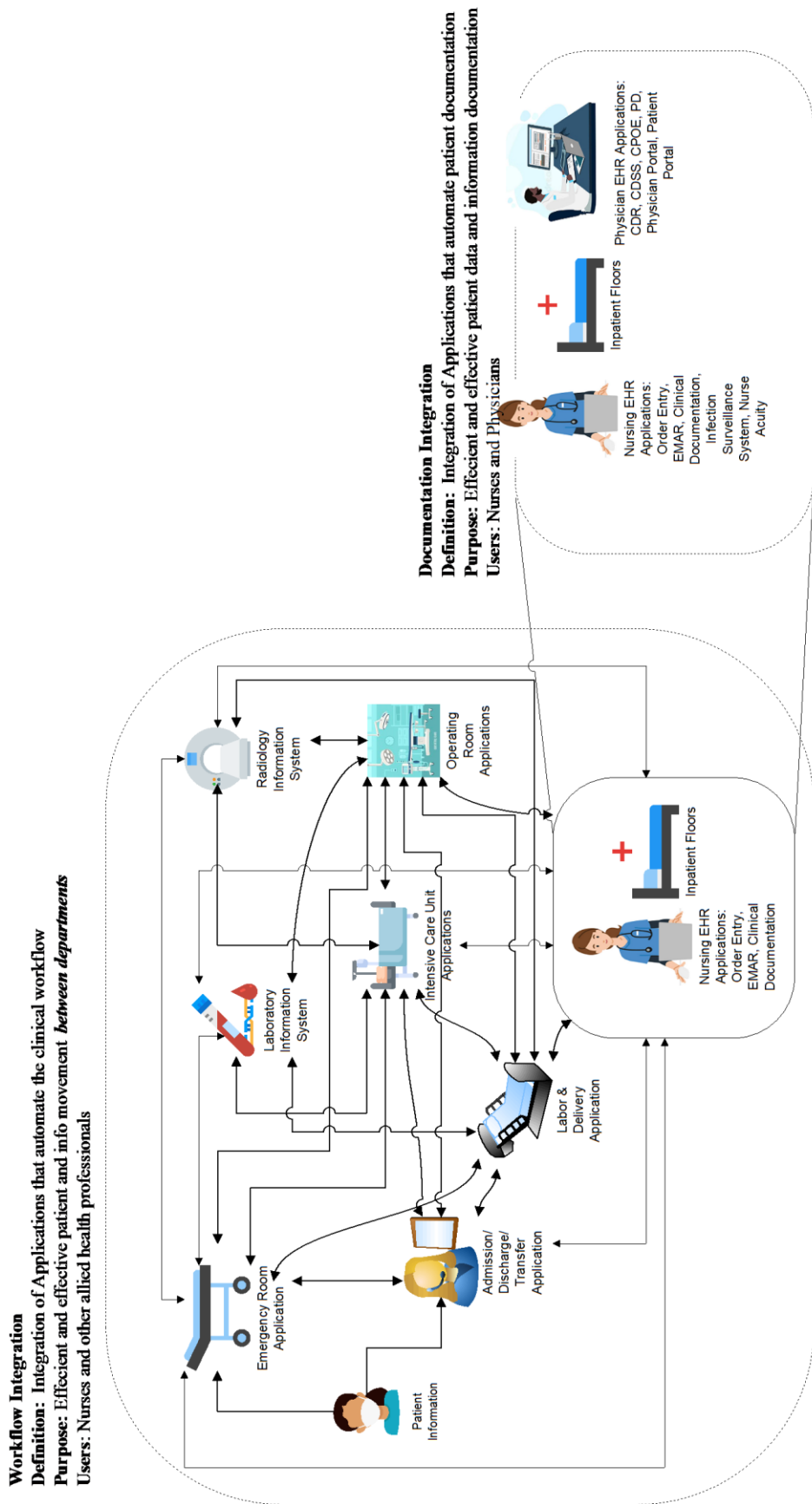| Review #	Verbatim quotes from Glassdoor reviews with routines keywords underlined	Mitigation strategy
1	*There are way too many computer programs to run at once. When I get to my computer in the morning, I have to open 7-9 windows. Rather than invest in one program that does it all, they keep adding more programs that each have their own function. Billing, <u>scheduling</u>, clinic notes, operative notes, insurance checking software—they all have their own program. Some of the programs work together, but not in an <u>efficient</u> way.* (Other Clinical; August 15, 2012)	Workflow integration, documentation integration
2	*The EMR is a nightmare made of 4 (5, 6?) different <u>systems</u> that <u>don't communicate</u> well (or at all) with one another. This is all in one hospital!* (Physician; May 14, 2013)	Workflow integration, documentation integration
3	*too many <u>conflicting</u> computer programs for record keeping, outdated technology & office equipment.* (Other Clinical; March 6, 2014)	Documentation integration
4	*Constant management changes. Understaffing of nurses and clinical technicians. Poor <u>coordination</u> between departments means that you have to get someone to keep calling to get something done.* (Other Clinical, June 22, 2015)	Workflow integration
5	*Excellent work environment and <u>collaboration</u> between doctors, surgeons, pharmacist, techs, management, and RNs, etc…* (Nurse; March 15, 2016)	Workflow integration
6	*Poor use of EMR. <u>Lack of collaboration between departments</u>. behind-the-times for use of tech. Overlake operates as if it's in the 1950s—Physicians are Kings, all else are "support staff." They have not figured out how to develop nursing, and do not allow for thinking outside the box. Lack creativity in <u>problem solving</u>. Rely on management and physicians to determine solutions.* (Nurse; June 28, 2017)	Workflow integration
7	*<u>Integrated care</u> delivery model is aspirational for many Leading edge on EMR <u>integration</u>, quality care management and coding, etc support Great benefits* (Physician; March 8, 2018)	Documentation integration
8	*…There's always a new program or initiative to make a nursing "easier" but usually results in additional charting and <u>less time</u> for actual patient care. (*Nurse; January 3, 2019)	Workflow integration, documentation integration
9	*Patient centered environment with accessible tools and resources to provide optimal medical care and treatment. Professional interdisciplinary <u>team</u>. <u>Effective communication throughout entire hospital</u>. Continuing education opportunities. Career development opportunities.* (Other Clinical; April 9, 2020)	Workflow integration

Figure 5. Conceptual Diagram Illustrating Workflow Integration and Documentation Integration at Hospitals

Figure 5 illustrates the workflow integration and documentation integration conceptual diagram, grounded in application integration theory (Angst et al., 2011, 2017), an upcoming area of inquiry that has enabled researchers to study post-adoption, ubiquitous, and mandatory use of IS artifacts such as EHRs. The application integration theory posits that integrating applications (through single-sourcing) within hospitals and between hospitals and their external partners has been found to improve economic outcomes for hospitals (Angst et al., 2011; Ayabakan et al., in press; Bardhan et al., 2022; Wowak et al., 2024). While there could also be value in sourcing applications from multiple vendors (Angst et al., 2017), in our study context of clinician well-being, it was mostly found to create operational inefficiencies and delays (Table 1).

As indicated in review numbers 5, 7, 10, 14, 15, 16, 18, 23, 30, and 38 (Appendix Table C1), clinicians consistently expressed how the use of multiple, disconnected applications impacts their daily efficiency. For instance, when asked to identify cons in their workplace, one clinician specifically mentioned the diverse applications and associated inefficiencies as a source of their job dissatisfaction.

> There are way too many computer programs to run at once. When I get to my computer in the morning, I have to open 7-9 windows. Rather than invest in one program that does it all, they keep adding more programs that each have their own function. Billing, scheduling, clinic notes, operative notes, insurance checking software--they all have their own program. Some of the programs work together, but not in an efficient way. (Other Clinical; August 15, 2012—Table C1, Review 1)

A recurring issue in these reviews is the reliance on diverse systems that fail to work seamlessly. Employees are often required to use multiple platforms for billing, scheduling, clinical documentation, and insurance verification, each with its own logins and interfaces. This disjointed setup not only wastes time but also increases the risk of errors and compromises data security. Moreover, the focus on navigating complex documentation processes detracts from time spent on direct patient care, frustrating clinicians and reducing productivity.

On the other hand, integrating applications has the potential to address routine issues. As shown in Reviews 6, 17, 19, 20, 24, and 25 (Table C1 in the Appendix), many employees praise the collaborative work environment across various personnel, including doctors, nurses, other clinicians, and support staff. The sense of teamwork is particularly strong between departments, such as the ER, and diagnostics such as CT scans, radiology, and lab services. The integrated care delivery model and advancements in EHR integration are viewed as aspirational as indicated in the below review:

> Wraparound care; fantastic online medical record system and coordination between departments; newer facility (Other Clinical; August 10, 2013—Table C1, Review 6)

Further investigation also reveals that negative reviews on routines are mainly related to the use of diverse applications within or between departments. For instance, Reviews 14, 15, 21, 29, 30, and 38 (Table C1) indicate that clinicians are mandated to use multiple charting, data, compliance, and education platforms, many of which are outdated and redundant. The implementation of new programs often duplicate information from existing systems, leading them to perform double or triple charting, causing frustration and delays, and taking valuable time away from direct patient interactions. Overall, using diverse applications *within* a department increases the documentation burden as well as the complexity associated with learning to use diverse applications.

> Small department = more workload on each person. Multiple charting/documentation systems to learn and use. Unrealistic expectations of daily tasks to be performed by management. (Nurse; November 26, 2020—Table C1, Review 38)

Similarly, if the applications *between* departments are not integrated, there may be a constant need to make phone calls to coordinate the interdepartmental workflow or keep a parallel trail of paper charts, which can waste precious clinician time and cause delays, as indicated in Reviews 4, 11, 12, 13, 22, 27, and 28 (Table C1). In other words, diversity in EHR applications may not improve coordination between departments as clinicians frequently encounter obstacles, such as inaccessible supplies and medications, requiring unnecessary trips between locations, which wastes valuable time for both patient care and documentation. The following review is one example indicating this time-consuming circumstance:

> Constant management changes. Understaffing of nurses and clinical technicians. Poor coordination between departments means that you have to get someone to keep calling to get something done. (Other Clinical; June 22, 2015—Table C1, Review 13)

Therefore, we posit that integrating diverse healthcare applications (Figure 6 and Appendix Table D1) to streamline ostensive routines can positively impact performative routines. While it is difficult to measure ostensive and performative routines, we argue that application integration represents the ostensive aspects of routines, as it streamlines and restructures the information flow within and between departments. On the other hand, employees' perceptions of organizational routines represent their performative aspects, as it indicates the

employee's perception of routines post-application integration. That is, streamlining routines involves integrating heterogeneous application configurations (ostensive routines) that may impact clinicians' perceptions of the routines (performative routines). Thus, the positive impact of application integration depends on configurations that restructure ostensive routines such as workflow or documentation; it then eventually improves performative routines such that clinicians have a positive appraisal of the routines.

In this study, workflow integration (WI) refers to the integration configuration of clinical information systems encompassing a wide range of hospital applications, including Emergency, Laboratory, Radiology, Admissions, Operating Rooms, Medication Administration, Clinical Documentation, etc. Integrating these applications is expected to make the physical movement of patients and electronic transmission of patient information *between departments* more efficient. In other words, sourcing these applications from a single vendor can streamline clinical workflows (see workflow integration in Figure 5) associated with nursing and other allied health professionals, such as laboratory or radiology technicians, as indicated in the below review:

> *This ER is very very hooked up as far as resources. We have CT scan, radiology, lab, ultrasound, and nearly every specialty in house. We get results fast and can offer very high quality care to our patients. On weekend nights the ER staff is excellent. The doctors are very knowledgeable as well as RNs, techs, and all support staff. It is more like a family than a work place. Very great place to work.* (Nurse, June 29, 2016—Table C1, Review 20)
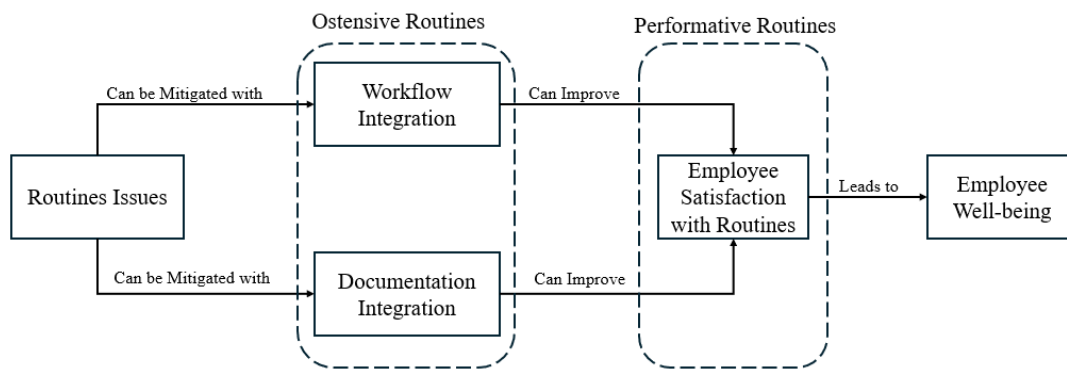
Similarly, documentation integration (DI) involves integrating applications that reduce the documentation burden by auto-populating patient data and eliminating redundancy. Sourcing these clinical documentation applications, such as order entry, clinical documentation, clinical data repository, computerized physician order entry, etc., from the same vendor can streamline the documentation routines (see documentation integration in Figure 5) carried out by nurses or physicians *within departments*, as indicated in the below review:

> *Integrated care delivery model is aspirational for many Leading edge on EMR integration, quality care management and coding, etc support Great benefits* (Physician; March 8, 2018—Table C1, Review 25)

Overall, employees spend significant time performing organizational routines, and inefficiencies in these routines directly affect their well-being. By integrating applications, organizations can improve workflows and reduce the stress associated with fragmented systems, ultimately enhancing employee satisfaction (RQ2).

Therefore, we propose a midrange *routines theory of employee well-being* (RTW) that explains the intricate role of organizational routines, through which the effect of EHRs on employee well-being is substantiated. The theoretical diagram in Figure 6 illustrates how routines-related issues, such as workflow inefficiencies, coordination, bottlenecks, and communication breakdowns, can be mitigated by integrating diverse IT applications used to carry out processes. This integration could occur either between the departments (clinical workflow integration) or within a department (clinical documentation integration), creating a more cohesive and efficient operational framework. By streamlining an organization's ostensive routines, application integration minimizes delays and inefficiencies, fostering smoother processes and reducing clinician frustration. However, the effectiveness of these ostensive routines ultimately hinges on their performative execution, i.e., how they function in practice and are perceived by employees. Clinicians' appraisal of these routines serves as a crucial indicator of the efficacy of ostensive routines and their own well-being, reinforcing the broader link between EHR integration, routines efficiency, and employee satisfaction.

Figure 6. Routines Theory of Employee Well-Being: Theoretical Diagram

Given the ubiquity of IT use and an expected increase in application diversity due to the introduction of artificial intelligence (AI) applications in organizational routines (Fornell, 2023), employee well-being can be considered a critical outcome variable that organizations and researchers need to prioritize. Our midrange theory extends the IS literature on unintended outcomes such as user resistance and technostress by explaining how streamlining organizational routines with application integration can promote well-being among employees.

4 Theory Testing

Building on the proposed RTW, we develop and test our hypotheses to address the impact of application integration decisions on performative routines, where the latter is measured using the clinicians' sentiment toward routines. In doing so, we also explore mechanisms that improve or worsen clinician well-being (RQ3).

4.1 Hypotheses Development

We contend that routine operational challenges can be mitigated by sourcing workflow and documentation applications from a single vendor, resulting in observable improvement in performative routines. These IT-enabled changes to both ostensive and performative routines can positively influence clinicians' satisfaction with their daily routines. This is because clinical workflow modules (workflow integration in Figure 5) sourced from the same vendor are more integrated and facilitate smoother and faster information sharing between departments, minimizing coordination and communication issues that may occur while transferring patients (or related information and materials) across different departments in a hospital. The following Glassdoor review (along with Reviews 6, 12, 20, and 35 in Table C1) indicates the positive impact that WI can have on clinician well-being:

> *Great pay, nice people, top of the line technology. Love that all departments are connected on the Electronic Health Record so patient information is easily accessible within the system which has really improved patient-centered care.* (Nurse; March 9, 2019)

Similarly, documentation modules (documentation integration in Figure 5) sourced from the same vendor offer a more efficient approach to documenting patient information across the patient care teams within the department. These systems allow for the auto-population of data, reduce redundant entries, and eliminate the complexity of managing multiple logins. By streamlining documentation, clinicians can save valuable time. The following Glassdoor review (along with Reviews 9, 13, 19, 26, 30, and 35 in Table C1) echoes this idea:

> *There's always a new program or initiative to make a nursing "easier" but usually results in additional charting and less time for actual patient care* (Nurse; January 3, 2019)

Based on these insights, we hypothesize:

H1: *Adopting single-sourced WI modules is positively associated with clinicians' sentiment toward routines.*

H2: *Adopting single-sourced DI modules is positively associated with clinicians' sentiment toward routines.*

4.2 Data

We combined multiple data sources to construct a longitudinal, multilevel panel dataset. Clinicians' sentiment toward hospital routines was derived from Glassdoor, along with additional variables such as star rating of the organization (e.g., work-life balance, culture, etc.), job tenure, job title, and review length. Further, we obtained data on hospital IT vendors and hospital characteristics (e.g., hospital type, ownership, geographic location, bed size, etc.) from the Healthcare Information and Management Systems Society (HIMSS) database. Supplementary operational characteristics, such as teaching status, case mix index (CMI), and average daily census, were obtained from the Centers for Medicare and Medicaid Services (CMS) impact file. We also included control variables, such as experiential quality data from CMS Hospital Compare and regional factors from the Food Environment Atlas, American Community Survey, and Federal Communications Commission.

An entity on Glassdoor could be a hospital or health system comprising multiple hospitals or other suppliers (e.g., physician groups, pharmacies, and equipment manufacturers). We manually identified each entity and select hospital participants (i.e., individual hospitals or health systems). We then conservatively matched Glassdoor reviews with hospital-level data based on entity names and reviewer locations. Since there were less than 10 Glassdoor reviews per year before 2012 and HIMSS data was available until 2017, our final panel spanned 7 years, from 2012 to 2018, with 12,084 clinician reviews for 1,396 hospitals.

4.3 Variable Construction

Our dependent variable is the sentiment of individual clinician reviews, calculated using a modified version of aspect-based sentiment analysis (ABSA) (Chang et al., 2022; Tao & Fang, 2020). Traditional sentiment analysis classifies an entire text as positive, negative,

or neutral using lexical-based resources. In contrast, ABSA calculates the sentiment score for a specific aspect within the text only, such as a certain feature of the focal product. Online reviews often contain information about multiple aspects, which can inflate or deflate the sentiment score for the aspects of interest. For example, the following Glassdoor "cons" review negatively addresses six aspects of the job: computer systems, management, parking, cafeteria, pharmacy, and education.

> *Non user friendly <u>computer system</u>; inflexible, not present nurse <u>manager</u>; <u>parking</u> is a nightmare for pm shift; <u>cafeteria</u> closes early on weekends; limited and geographically inconvenient <u>pharmacy</u>; poor nursing <u>education</u>.* (Nurse; October 28, 2016)[6]

Using the keyword dictionary and categories created in topic mining (See Section 3.3), we extracted sentences corresponding to the routine's aspects of each review only. We then used SentiWordNet to assign the sentiment scores for the extracted sentences (Khan et al., 2014). As an illustration, the sentiment score for IT aspect would be calculated solely based on the extracted sentence: "*Non user friendly <u>computer system</u>.*" This process was applied to both pros and cons reviews, and the final dependent variable is the combined sentiment score for pros and cons reviews related to hospital operations divided by the number of counted words (Appendix Table E1).

Our primary independent variables of interest are WI and DI, which anchor on single-sourcing strategies. Using sequence analysis, we constructed WI and DI measures at the hospital-year level (Angst et al., 2017). They were calculated as the average ratios of applications adopted from a single vendor. We focused on 18 commonly implemented hospital applications, as listed in Table D1. In particular, WI includes Emergency, Laboratory, Radiology, Admission Transfer Discharge, Labor and Delivery, ICU, Operating Rooms, Order Entry, Medication Administration, and Clinical Documentation applications. DI includes Order Entry, Medication Administration, Clinical Documentation, Infection Surveillance System, Nurse Acuity, Clinical Data Repository, Clinical Decision Support System, Computerized Physician Order Entry, Physician Documentation, Physician Portal, and Patient Portal.

We implemented a two-step approach to assess how a given vendor configuration of the WI and DI applications deviated from a single-sourcing prototype. In the first step, we determined the dominant vendor who supplied the majority of WI and DI applications for each hospital-year observation. A

prototype single-sourcing sequence can be derived by sourcing all applications from that dominant vendor. In the second step, we compared the actual sourcing configuration with the single-sourcing prototype and measured their similarity using Levenshtein distance.

Specifically, we calculated the number of edits (insertions, deletions, and substitutions) it took for every hospital-year observation to transform from its focal configuration to the single-sourcing prototype. We then normalized the value by dividing it by the number of applications implemented and inverting the result. The final variable varied between 0 and 1, with the value of 1 indicating a perfect match with the single-sourcing prototype. For instance, assume a hospital's WI configuration is A-A-A-NA-B-B-C-C each year, where ABC represents three vendors while NA represents no implementation. The dominant vendor is A, and the prototype single-sourcing sequence is A-A-A-NA-A-A-A-A. It took four substitutions to transform from the actual configuration to the prototype single-sourcing sequence; therefore, the Levenshtein distance is four. After normalization, the value of WI equals 0.43 for this observation.

Furthermore, we included a broad spectrum of control variables at the review, hospital, and regional (county) levels to mitigate confounding concerns. These controls were selected mostly based on the topic mining results. For instance, the patient-to-nurse ratio seems to be one of the most common hospital aspects, appearing in more than 8000 clinician reviews. Similarly, clinicians often mention organizational pressure to improve Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) patient satisfaction scores. As such, we constructed a measure of experiential quality based on staff communication and responsiveness. In the interest of space, we present a thorough definition of variables and their summary statistics in Table 2.

Our sample shows an average clinician sentiment score for hospital routines of -0.03, indicating that clinicians were generally dissatisfied with hospital routines. Consistent with existing literature, the mean WI and DI scores were 0.77 and 0.84, respectively, suggesting that hospitals were more likely to integrate documentation applications than workflow applications.

4.4 Baseline Model Specification

We tested our hypotheses by analyzing how the hospital-level WI and DI strategies affect individual-level clinician sentiment toward routines. Specifically, we estimated the following model:

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[6] Underlining in quotes has been added for emphasis.

$$GDSentiment_{it} = \beta_0 + \beta_1 WI_{ht} + \theta X_{it} + \delta Z_{ht} + \phi G_{rt} + \alpha_h + \lambda_t + \varepsilon_{it} \quad (1)$$

The dependent variable is the combined sentiment of pros and cons for operation-related review i at time t adjusted for the number of words in the review. The key independent variable of interest, *WI*, measures the degree of single-sourcing for workflow applications in hospital h at time t. Similarly, we replaced *WI* with *DI* to examine the impact of single-sourced documentation applications while keeping the other specifications the same. We included a wide list of aforementioned control variables at the review,

hospital, and regional levels, represented by the *X*, *Z*, and *G* vectors, respectively. α_h represents the hospital fixed effects to account for time-invariant hospital heterogeneity while λ_t represents the time fixed effects for year and month. The primary coefficient, β_1, measures the effect of single-sourcing strategies for WI and DI on clinicians' satisfaction with hospital routines, as represented by the combined review sentiment. A positive and significant coefficient indicates that an integration configuration that is closer to a single-sourcing strategy is associated with greater clinician satisfaction and vice versa.

Table 2. Variable Definitions and Summary Statistics

Variable	Definition	Mean	(St. Dev.)
GDSentiment	Combined sentiment score of pros and cons reviews related to hospital routine operations, divided by the number of counted words.	-0.03	(0.44)
WI	Degree of WI, defined as the ratio of interdepartmental modules adopted from a single vendor in year t-1.	0.77	(0.22)
DI	Degree of DI, defined as the ratio of documentation modules adopted from a single vendor in year t-1.	0.84	(0.18)
Review-level controls			
Tenure	Number of years working for the hospital.	3.26	(3.28)
Helpfulness	Number of times a review is considered helpful.	1.18	(1.98)
Balance	Rating regarding work/life balance.	3.18	(1.29)
Culture	Rating regarding culture and values.	3.32	(1.41)
Career	Rating regarding career opportunities.	3.32	(1.28)
Compensation	Rating regarding compensation and benefits.	3.30	(1.23)
Management	Rating regarding senior management.	2.75	(1.38)
Nurse	1 = review is written by a nurse, 0 = other types of clinicians	0.61	(0.49)
Hospital-level controls			
Type	1 = acute care hospital, 0 = other types of specialty hospital.	0.65	(0.48)
Magnet	1 = magnet hospital, 0 = otherwise.	0.27	(0.44)
Ownership	0 = not-for-profit, 1 = for-profit, 2 = public (government-owned).	0.30	(0.64)
Urban	1 = hospital is located in urban area, 0 = rural area.	0.81	(0.39)
Res-to-bed	Resident to bed ratio, to represent teaching intensity.	0.14	(0.21)
Bed	Log-transformed number of staff beds.	5.74	(0.74)
MCRPercent	Ratio of inpatient services provided to Medicare patients.	0.25	(0.16)
MCDPercent	Ratio of inpatient services provided to Medicaid patients.	0.10	(0.11)
CMI	Case mix index.	1.73	(0.26)
Patient-to-nurse	Patient-to-nurse ratio, to measure the level of nurse staffing.	1.20	(5.08)
EQ	Experiential quality based on patient satisfaction from HCAHPS survey regarding staff communication and responsiveness.	69.19	(3.63)
Regional-level controls			
HHI	Herfindahl-Hirschman Index in the hospital referral region, calculated using inpatient admissions.	0.12	(0.11)
Grocery	Number of grocery stores per 1,000 population in the county.	0.21	(0.11)
Commute	Average travel time (in minutes) to work in the county.	25.67	(4.60)
Internet	1 = majority of residents in the county have access to broadband internet (10 Mbps), 0 = otherwise.	0.54	(0.48)

Note: Summary statistics are based on the entire sample of 12,084 reviews.

4.5 Baseline Estimation Results

We present our baseline estimation results in Table 3. Column 1 shows that the coefficient for WI is positive and significant, suggesting that integrating applications to streamline workflow leads to a substantial increase in clinician sentiment. This finding aligns with the insights from our qualitative analysis, which highlighted the benefits of smoother interdepartmental information sharing and coordination. Conversely, Column 2 reveals no significant effect of DI on clinician sentiment. While we anticipated an increase in satisfaction due to the reduced documentation burden facilitated by DI applications, this result does not support our hypothesis. Importantly, we tested other possible combinations of WI and DI configurations incrementally, as detailed in Table D2, and the results remain robust. [7] Based on these findings, we conclude that H1 is supported, as WI configurations significantly enhanced clinician sentiment toward routines. However, H2 is not supported because DI configurations did not exhibit a similar effect.

4.6 Identification Strategy

Application integration at hospitals is not an exogenous decision and is likely subject to a hospital's operational efficiency and performance. Although we controlled for a broad set of covariates and two-way fixed effects, endogeneity concerns may still persist. Hence, we deployed an instrument variable (IV) approach to address the identification concerns. An ideal instrument should affect the focal hospital's EHR sourcing strategy but not systematically determine its operation aspects. To meet this criteria, health IT literature often resorts to the other regional partner hospitals affiliated with the same health system but located in different referral regions (HRR) from the focal hospital (Angst et al., 2010; Ganju et al., 2022). Following these studies, we constructed the average rates of WI and DI among these remote peers as an IV for the focal hospital.

The rationale is that hospitals in the same system share similar IS strategies, according to institutional theory and network effects, leading to a correlation between our IVs and the focal hospital's WI and DI scores (Angst et al., 2017; Bardhan et al., 2022). On the other hand, these remote peers' IS strategies should not directly affect the routine operations in the focal hospital due to the long distance. We conducted various tests in Table 4 to validate our IVs. Columns 1 and 2 indicate that regional partner hospitals' WI and DI rates are strongly associated with higher WI and DI adoptions at the focal hospital. The *F*-statistics are larger than 839.91 in both columns and the weak IV tests have *p*-values < 0.001. These results support the relevance assumption of our IVs.

We then performed a two-stage least square (2SLS) model with fixed effects; we provide the estimation results of the second stage in Table 5. The findings are consistent with our main analysis: WI had a significant positive effect on clinician sentiment toward routines, while DI continued to show no significant impact. We conducted some additional analysis to examine the heterogeneity in our baseline for clinician types and hospital types. Results and discussion are presented in Appendix F.

4.7 Mechanisms and Findings

Our research provides robust evidence that streamlining hospital routines through integrated applications either improves clinician satisfaction or has no significant impact. These findings support the growing trend of integrating IS applications in hospitals. However, a critical follow-up question arises: *What are the mechanisms through which EHR influences clinician well-being?* (RQ3). To explore this question, we utilized clinicians' Glassdoor ratings of work-life balance as a moderating factor in the relationship between WI/DI and clinician sentiment. We focused on work-life balance because this category frequently appeared in our keyword analysis, with terms such as "work-life balance" (frequency = 692), "weekend" (frequency = 689), and "holiday" (frequency = 1120) being prominent in reviews.

Several prior studies have examined work-life balance in the context of clinician well-being (NAM, 2019), finding that clinicians often have to work outside their regular hours in order to manage clinical documentation (Adler-Milstein et al., 2020), which may negatively impact their "pajama time" and overall work-life balance (Moy et al., 2021). Glassdoor defines work-life balance as "the idea of creating and maintaining clear distinctions and boundaries between what is work and what is not."[8] Therefore, hospitals with high ratings for work-life balance are expected to amplify the positive relationship between application integration and clinician well-being. For instance, the following review illustrates that clear policies, boundaries, and work-life balance are appreciated by clinicians:

> *Northside is very policy-based. If there ever is a disagreement on how things should be done, we refer to policy. End of discussion, especially between MDs and RNs. Great benefits and work-life balance.* (Nurse; October 13, 2017)

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[7] Results available on request.

[8] https://www.glassdoor.com/blog/work-life-fit/

Table 3. Estimation Results of Baseline Model

	(1)	(2)
DV	Clinicians' sentiment toward routines	
WI	0.123** (0.060)	
DI		0.050 (0.060)
Constant	-1.688** (0.700)	-1.793*** (0.680)
Observations	8,591	8,587
R-squared	0.278	0.278
Hospital FE	Yes	Yes
Time FE	Yes	Yes
Review controls	Yes	Yes
Hospital controls	Yes	Yes
Regional controls	Yes	Yes
Note: Other control variables are included in the estimation and not reported for brevity. Robust standard errors are presented in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.		

Table 4. First Stage Results of 2SLS Model

DV	(1) WI	(2) DI
WI in regional partner hospitals	0.978*** (0.007)	
DI in regional partner hospitals		0.972*** (0.007)
Constant	-0.457*** (0.080)	-0.098 (0.066)
Observations	10,297	10,286
R-squared	0.949	0.948
Hospital FE	Yes	Yes
Time FE	Yes	Yes
Review controls	Yes	Yes
Hospital controls	Yes	Yes
Regional controls	Yes	Yes
Note: Other control variables are included in the estimation and not reported for brevity. Robust standard errors are presented in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.		

Table 5. Second Stage Result of 2SLS Model

DV	(1)	(2)
	Clinicians' sentiment toward routines	
WI	0.183*** (0.060)	
DI		0.115 (0.070)
Constant	-1.654** (0.682)	-1.747** (0.685)
Observations	8,591	8,589
R-squared	0.277	0.276
Hospital FE	Yes	Yes
Time FE	Yes	Yes
Review controls	Yes	Yes
Hospital controls	Yes	Yes
Regional controls	Yes	Yes
Note: Other control variables are included in the estimation and not reported for brevity. Robust standard errors are presented in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.		

Table 6, Columns 1 and 2 present the results. We find that work-life balance positively moderates the effect of WI and DI on clinician sentiment toward routines. Specifically, a 1 standard deviation increase from the mean of the work-life balance rating is associated with 62.93% higher net effect of WI. Furthermore, the baseline impact of DI on clinician sentiment equals 0.115 and becomes significant (p-value = 0.021). This interesting finding highlights the crucial role of non-IT factors, such as work-life balance, in manifesting the positive impact that application integration has on clinician satisfaction with routines. That is, a better work-life balance serves as a complementary condition at a hospital to help maximize the positive impact that application integration actions have on clinicians and their daily lives.

In the same vein, our topic mining results also uncovered frequent keywords related to staffing issues, such as "understaff" (frequency = 3608), "short staff" (frequency = 2134), and "staff patient ratio" (frequency = 2255). Inadequate staffing is a well-known contributor to clinician burnout (NAM, 2019), yet its impact on patient and clinician outcomes is underexplored (Twigg et al., 2021), especially within IS research with a few exceptions (Lu et al., 2018). Furthermore, staffing-related challenges are becoming more prominent due to increased strikes in the US healthcare sector (Abelson & Baumgaertner, 2023; Stevens, 2025). The following clinician review captures how staffing issues can exacerbate the problems associated with workflow and documentation routines:

> *Nurse to Patient Ratios in the ED are unbelievable sometimes ranging from 10-12 per Nurse. We have no ancillary staff to help support Nurses. Nurses are often overwhelmed having to do everything whereas on the floors, there are techs/aides who help out tremendously.* (Nurse; March 3, 2020)

The review highlights the high-pressure work environment created by staffing shortages and unrealistic performance expectations. Nurses and other staff are often pushed to take on extra shifts, with little tolerance for calling in sick despite personal health issues. This undermines employee well-being and contributes to burnout, particularly in small departments where individuals must handle an excessive range of responsibilities. Staff members describe feeling undervalued and are afraid to speak up due to a lack of support from management, exacerbating the overall sense of dissatisfaction.

Table 6. Moderating Effects of Work-life Balance and Patient-to-Nurse Ratio

	(1)	(2)	(3)	(4)
DV	Clinicians' sentiment toward routines			
WI	0.117**		0.122***	
	(0.053)		(0.042)	
DI		0.048		0.087
		(0.062)		(0.053)
Work-life balance	0.058***	0.059***		
	(0.005)	(0.005)		
WI × Work-life balance	0.060***			
	(0.017)			
DI × Work-life balance		0.050**		
		(0.021)		
Patient-to-Nurse			-0.003***	-0.003***
			(0.001)	(0.001)
WI × Patient-to-nurse			-0.009**	
			(0.004)	
DI × Patient-to-nurse				-0.023*
				(0.012)
Constant	-1.350**	-1.456**	-1.108	-1.170*
	(0.681)	(0.681)	(0.674)	(0.675)
Observations	8,591	8,587	8,492	8,485
R-squared	0.279	0.278	0.278	0.277
Hospital FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Review controls	Yes	Yes	Yes	Yes
Hospital controls	Yes	Yes	Yes	Yes
Regional controls	Yes	Yes	Yes	Yes
Note: Other control variables are included in the estimation and not reported for brevity. Robust standard errors are presented in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.				

In other words, poor staffing ratios might diminish the positive impact of application integration on clinician well-being. This relationship is logical given that while EHR use is federally mandated, there are no requirements for minimum staffing ratios (Geng et al., 2019; Svetvilas & Morris, 2023). This may lead to clinicians using complex, diverse applications under time-sensitive and stressful conditions. Indeed, the following review indicates the aggravating nature of staffing levels on organizational routines.

> *Constant need for staffing as supply of RN/BSN is not enough When inpatient population is high. Then manager may not be sensitive to the needs of the unit and pile on work duties in the face of staff shortages. Due the large nature of the corporate structure, many decisions that directly affect the employee impact negatively on work performance. Transition and changes in policies and procedures along with new*

> *technologies can be upsetting in the day to day efficiency of the unit.* (Nurse; October 6, 2017)

Therefore, we tested if the positive relationship between streamlining organizational routines and clinician well-being is negatively moderated by poor staffing levels. We measured staffing levels using the variable *patient-to-nurse*, which is calculated at the hospital level as the ratio of the average daily census to the number of nurses. A higher patient-to-nurse ratio implies stressful routines for nurses. Consistent with the qualitative evidence and expectations, results in Table 6, Columns 3 and 4 show significantly negative moderation effects of patient-to-nurse ratio on the relationship between application integration and clinician sentiment toward routines. As staffing levels deteriorate (i.e. increase in patient-to-nurse ratio), the positive impact of WI weakens (Column 3). Similarly, under poor staffing conditions, DI shows a negative effect compared to situations with better staffing levels (Column 4).

(A) Effect of WI by Work-Life Balance

(B) Effect of DI by Work-Life Balance

(C) Effect of WI by Patient-to-Nurse Ratio

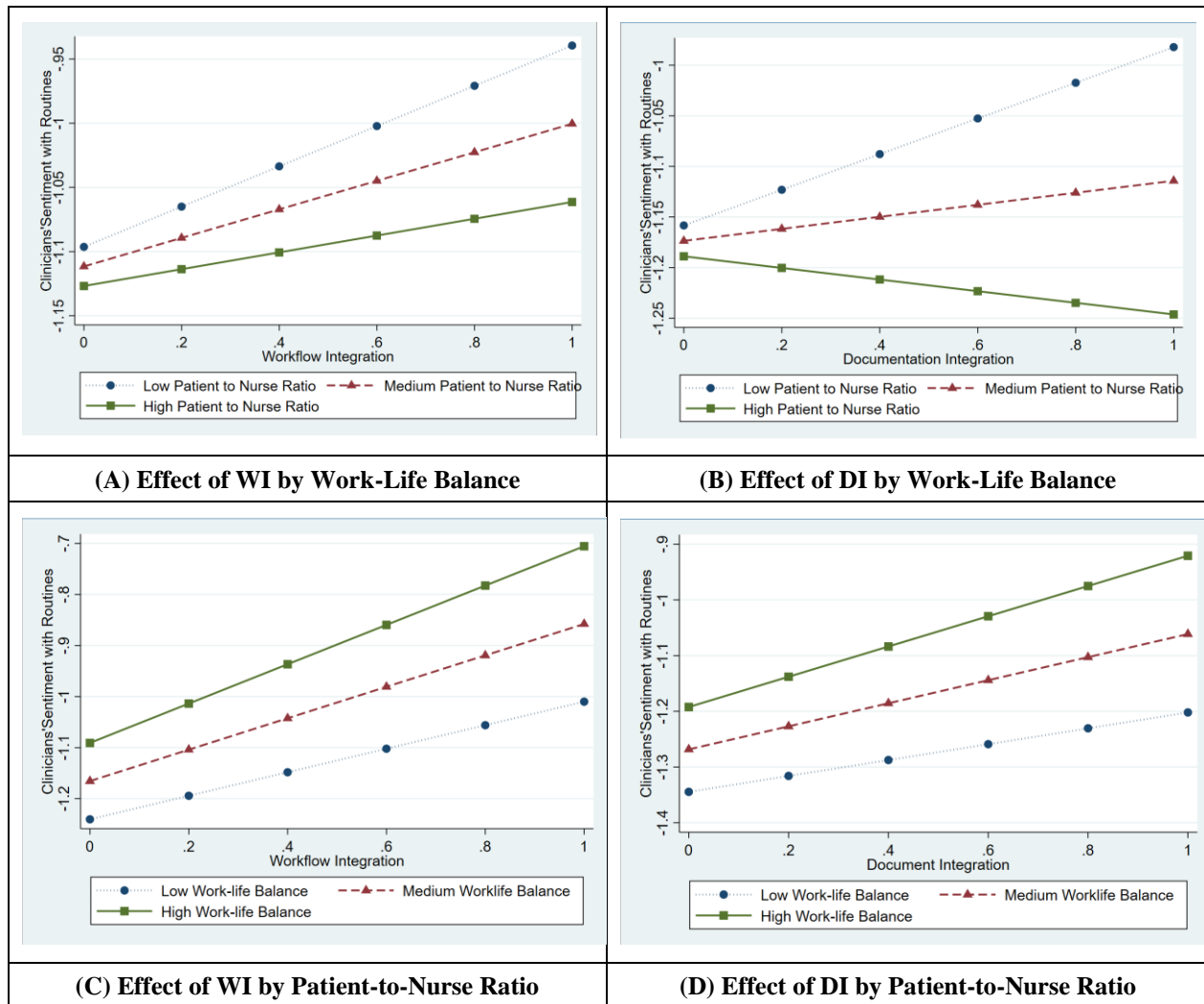**(D) Effect of DI by Patient-to-Nurse Ratio**

Figure 7. Moderating Effects of Work-Life Balance and Patient-to-Nurse Ratio

Figure 7 graphically illustrates the importance of work-life balance and patient-to-nurse ratios in improving clinicians' sentiment toward routines. Broadly, it indicates how the interplay between organizational IT (application integration) and non-IT decisions (work-life balance and patient-to-nurse ratio) affects clinician well-being. Overall, these findings are novel and critical to understanding the nuanced relationship between EHR integration and clinician burnout. They suggest that the interplay between organizational IS decisions (e.g., application integration) and non-IS factors (e.g., work-life balance and staffing levels) plays a vital role in influencing clinician well-being. Specifically, hospitals with better work-life balance can maximize the positive effects of application integration, while poor staffing levels exacerbate the challenges associated with EHR. Together, these insights reconcile the love-hate relationship clinicians have with EHRs and underscore the importance of aligning IS strategies with broader organizational and policy considerations.

5 Discussion

In this work, we study the problem of clinician burnout using an alternate data source—large, unstructured, publicly available clinician reviews from Glassdoor. While several survey-based studies have measured clinician burnout using popular and validated instruments (such as Maslach burnout inventory, NASA-task load index, and American Medical Association's Mini Z well-being surveys), we took a different approach. By leveraging the computationally intensive theory discovery (CITD) approach (Berente et al., 2019; Miranda et al., 2022), we developed a midrange theory and then tested it to generate theories in flux (TIF) (Tremblay et al., 2021), offering novel and relevant insights for researchers and practitioners. In doing so, we addressed the clinician burnout problem using a large sample of 55,441 textual reviews and explored a comprehensive list of potential factors without making a priori assumptions.

Although EHR usability and the associated documentation burden are often cited as major contributors to clinician burnout, our topic mining results reveal that IS and EHR concerns appear less frequently in clinician reviews than commonly assumed. Instead, clinicians are more vocal about routine operational issues when reviewing their employing hospitals. A deeper qualitative exploration of these reviews suggests that many of these routines-related challenges could be mitigated by integrating workflow and documentation applications.

Through disciplined reflection (Leidner & Gregory, 2024) and consideration of theoretical perspectives from IS and related disciplines, we drew connections between organizational routines theory (Feldman & Pentland, 2003; Novak et al., 2012) and application integration theory (Angst et al., 2011, 2017) to understand how IT-related organizational decisions impact employee well-being. We proposed a midrange RTW that explains how streamlining organizational routines through application integration can positively impact employee well-being. We conceptualized integrating applications used between and within hospital departments as restructuring and streamlining ostensive routines. While performative routines are typically difficult to measure, the detailed descriptions of routines in clinician reviews, combined with sentiment scores, serve as a reasonable proxy for assessing the performative efficacy of these routines.

We tested our midrange theory using a multilevel econometric investigation. Our findings indicate that integrating workflow applications (WI) significantly improves clinician sentiment toward routines, whereas integrating document applications (DI) does not. These results hold across various integration configurations, meaning that adding or removing applications from WI and DI configurations does not alter the outcomes, as long as the configuration integrates workflow (facilitating patient and information movement between departments) or documentation (auto-populating patient data and reducing redundant data entry within a department).

Our mechanism tests further reveal that the positive impact of WI is amplified in hospitals with strong work-life balance ratings. However, this positive effect is significantly diminished in hospitals with poor staffing levels. In other words, as the patient-to-nurse ratio increases, the benefits of streamlining routines through application integration decrease. These findings challenge the prevailing belief that EHR and IT primarily contribute to clinician burnout. Instead, our results suggest that while application integration has a net positive impact on clinician well-being, this effect is substantiated through non-IT factors, such as a hospital's emphasis on work-life balance and adequate staffing ratios.

These findings have critical implications for both practitioners and policymakers. We address the discordant evidence on EHR use and impact, which has been shown to generate economic and patient outcomes at the organizational level but has also been identified as a major contributor to burnout among clinicians at the individual level. While federal initiatives have focused on improving EHR usability and reducing documentation burden (ONC, 2020), our study highlights the importance of routines and integrating the diverse applications used by nurses and other clinicians. Additionally, our results help fill knowledge gaps in understanding the role of IT and EHR in clinician burnout, particularly among lesser-studied allied health professionals such as nurses and technicians (NAM, 2019). Most importantly, our findings underscore the need for healthcare administrators to make strategic decisions, such as integrating diverse applications, fostering work-life balance, and maintaining appropriate staffing levels, that enhance hospital routines and, in turn, improve clinician well-being.

As a data-driven, multimethod study, our research has several limitations. First, our dataset does not include a representative sample of physicians, who are also the primary users of documentation-related applications. This omission may limit our ability to capture nuanced effects of documentation integration. Second, while our modified version of ABSA provides a reliable measure of clinician sentiment regarding routines, there is a potential for false positives or false negatives. However, given that routines and related keywords are among the most frequently discussed topics, our results are likely robust against such issues. Finally, while computational methods enable efficient analysis of large unstructured datasets, manual qualitative analyses resemble "finding a needle in a haystack." There remains a possibility that additional nuances or mechanisms influencing the relationship between application integration and clinician well-being were overlooked.

6 Theoretical Triangulation

The key contribution of this study is that we triangulate the theoretical understanding related to clinician well-being. Triangulation involves examining a phenomenon using multiple methods and discursive flexibility to achieve a deeper and more comprehensive understanding of the problem (Burton & Obel, 2011; Miranda et al., 2022). By combining traditional research methods with computational techniques to analyze large-scale unstructured data, we integrate midrange theory development with empirical testing, generating novel microtheoretical insights (Tremblay et al., 2021).

We summarize our theoretical triangulation process in Table 7, comparing our study with related seminal works and highlighting how this study extends the existing theoretical discourse. While we reference multiple theories throughout this work, three key frameworks of organizational routines, application integration, and technostress theories form the foundation of our triangulated understanding of clinician well-being, grounded in a large-scale unstructured dataset.

First, this study uncovers the central role of performative routines in shaping clinician well-being. On the one hand, integrating applications (i.e., sourcing them from a single vendor) represents the ostensive component of routines, as it reconfigures and streamlines procedural structures to guide how employees execute their tasks. On the other hand, employees' reflections on their experiences with these routines, categorized as pros or cons in their reviews (indicating what works versus what does not), represent the performative aspect. This distinction offers new insights into how technological decisions influence workplace routines and well-being.

Second, while application integration theory (Angst et al., 2017) is traditionally grounded in institutional theory, focusing on organizations' application similarity with external peer institutions, our study shifts the focus inward. We examine internal application similarity—within and across hospital departments—through the lens of organizational routines theory. In doing so, we extend both application integration theory (Angst et al., 2017) and organizational routines theory (Feldman & Pentland, 2003), demonstrating their combined impact on clinician well-being.

Finally, and most significantly, this study advances technostress theory (Tarafdar et al., 2019) by introducing an organization-level perspective. While prior research on technostress has primarily examined its sociotechnical dimensions, we identify application integration as a potential mitigant of technostress among clinicians. Crucially, our findings reveal that non-IT constructs (e.g., patient-to-nurse ratio) can significantly weaken the technostress mitigating effects of application integration. This is a critical finding that can inform this field of inquiry, which has yet to fully explore the moderating effects of organizational factors in alleviating or aggravating technostress (Tarafdar et al., 2019). Given the growing adoption of AI applications in healthcare, we anticipate a revival in technostress as well as burnout among IT users. Our midrange theory offers a framework to explain and potentially mitigate such unintended consequences.

Additionally, our study raises important new research questions: Can the integration of diverse applications substitute for skilled healthcare workers?[9] Interestingly, our findings suggest otherwise. The positive effects of application integration are diminished in hospitals with poor staffing levels, implying that technology cannot fully replace the complex, high-stakes routines performed by clinicians. This has significant implications for healthcare administrators, who must avoid the flawed assumption that integrating EHR applications can compensate for reduced nurse staffing. These findings align with ongoing nationwide clinician protests advocating for safe staffing levels (Abelson & Baumgaertner, 2023; Stevens, 2025). However, further research is needed to develop a more comprehensive theoretical understanding in this area. Similarly, most extant research on the impact of application integration shows positive economic, patient, and clinician outcomes; thus, future research can study the unintended consequences of dependency on a single vendor within healthcare organizations or the impact of monopolistic behavior from dominant EHR vendors.

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[9] We thank Shaila Miranda for this feedback at the 22nd JAIS Theory Development Workshop in Bangkok, Thailand.

Table 7. Theoretical Triangulation

	Organizational routines theory	Application integration theory	Technostress theory	This study
Key discourses	Feldman & Pentland, 2003	Angst et al., 2011, 2017; Bardhan et al., 2022	Tarafdar et al., 2019	
Discipline	Management	Information systems	Information systems	Information systems
Central idea	Routines are repetitive and interdependent actions taken by multiple actors that can impact organizational stability.	Disparate EHR applications sourced from similar vendors can improve outcomes.	Eustressors invoke positive psychological responses while distressors invoke negative psychological responses among IT users.	Streamlining routines through application integration can improve employee well-being.
Level of theory (Leidner & Gregory, 2024)	Grand theory	Midrange theory	Grand theory	Midrange theory
Study design	Case-based, simulation	Econometrics	Survey, qualitative	Computationally intensive, econometrics
Unit of analysis	Firm	Firm	Individual	Individual
Level of analysis	Firm	Firm	Individual	Firm
Studied constructs	• Ostensive routines • Performative routines • Stability and change in process dynamics	• Single-sourcing • Multi-sourcing • Application integration (with external partners) • Healthcare value	• Eustressors • Distressors • Job satisfaction • End-user satisfaction	• Application integration (within and between departments) • -Employee satisfaction with routines
This study's theoretical contribution (theories in flux)	• "Application integration" as a proxy for ostensive routines • "Employee perception of routines" as a proxy for performative routines • Organizational routines can impact employee wellbeing	• Application integration can streamline organizational routines and impact employee wellbeing	• Application integration can mitigate technostress • Non-IT factors such as staffing levels can weaken technostress mitigants.	

7 Conclusion

Post-COVID, a social shift has emerged, marked by trends such as quiet quitting and a rise in mental health concerns (Gallup, 2023). In this evolving landscape, it is important for employers to prioritize employee well-being as a core aspect of their strategic initiatives. This multimethod study, analyzing 55,441 clinician reviews on Glassdoor, highlights the significant role of IT in shaping organizational routines and, in turn, influencing job satisfaction. While application diversity is inherent to healthcare, our findings suggest that reducing fragmentation and streamlining routines can enhance employee well-being. These insights are particularly timely, as the increasing adoption of AI-driven technologies is expected to further diversify and fragment application ecosystems, posing new challenges for organizations, especially within healthcare (Fornell, 2023).

References

Abelson, R., & Baumgaertner, E. (2023). Kaiser Permanente health care workers begin strike. *The New York Times*. https://www.nytimes.com/2023/10/04/health/kaiser-permanente-strike-health-care.html

Adler-Milstein, J., Zhao, W., Willard-Grace, R., Knox, M., & Grumbach, K. (2020). Electronic health records and burnout: Time spent on the electronic health record after hours and message volume associated with exhaustion but not with cynicism among primary care clinicians. *JAMIA*, *27*(4), 531-538.

Angst, C. M., Agarwal, R., Sambamurthy, V., & Kelley, K. (2010). Social contagion and information technology diffusion: The adoption of electronic medical records in U.S. Hospitals. *Management Science*, *56*(8), 1219-1241.

Angst, C. M., Devaraj, S., Queenan, C. C., & Greenwood, B. (2011). Performance effects related to the sequence of integration of healthcare technologies. *Production and Operations Management*, *20*(3), 319-333.

Angst, C. M., Wowak, K. D., Handley, S. M., & Kelley, K. (2017). Antecedents of information systems sourcing strategies in U.S. hospitals: A longitudinal study. *MIS Quarterly*, *41*(4), 1129-1152.

Arnold, E. L., Sikes, D. H., & Harrington, J. T. (2020). Clinician burnout and professional well-being. *JAMA*, *323*(13), 1317-1318.

Ayabakan, S., Atasoy, H., & Pang, M.-S. (in press). Where is my money? The interplay between healthcare information technologies and denied claims. *MIS Quarterly*.

Ayabakan, S., Bardhan, I., Zheng, Z., & Kirksey, K. (2017). The impact of health information sharing on duplicate testing. *MIS Quarterly*, *41*(4), 1083-1104.

Ayyagari, R., Grover, V., & Purvis, R. (2011). Technostress: Technological antecedents and implications. *MIS Quarterly*, *35*(4), 831-858.

Bao, C., Bardhan, I. R., Singh, H., Meyer, B. A., & Kirksey, K. (2020). Patient-provider engagement and its impact on health outcomes: A longitudinal study of patient portal use. *MIS Quarterly*, *44*(2), 699-723.

Bardhan, I. R., Bao, C., & Ayabakan, S. (2022). Value implications of sourcing electronic health records: The role of physician practice integration. *Information Systems Research, 34*(3), 1169-1190.

Berente, N., Seidel, S., & Safadi, H. (2019). Research commentary—data-driven computationally intensive theory development. *Information Systems Research*, *30*(1), 50-64.

Bhargava, H. K., & Mishra, A. N. (2014). Electronic medical records and physician productivity: Evidence from panel data analysis. *Management Science*, *60*(10), 2543-2562.

Blei, D. M. (2012). Probabilistic topic models. *Communications of the ACM*, *55*(4), 77-84.

Blei, D. M., & Lafferty, J. D. (2009). Topic models. In A. N. Srivastava & M. Sahami (Eds.), *Text mining* (pp. 101-124). Chapman & Hall/CRC.

Brigham, T., Barden, C., Dopp, A. L., Hengerer, A., Kaplan, J., Malone, B., Martin, C., McHugh, M., & Nora, L. M. (2018). A journey to construct an all-encompassing conceptual model of factors affecting clinician well-being and resilience. *NAM Perspectives*, *8*(1), 201801b.

Burton, R. M., & Obel, B. (2011). Computational modeling for what-is, what-might-be, and what-should-be studies—and triangulation. *Organization Science*, *22*(5), 1195-1202.

Califf, C. B. (2022). Stressing affordances: Towards an appraisal theory of technostress through a case study of hospital nurses? Use of electronic medical record systems. *Information and Organization*, *32*(4), Article 100431.

Califf, C. B., Sarker, S., & Sarker, S. (2020). The bright and dark sides of technostress: A mixed-methods study involving healthcare IT. *MIS Quarterly*, *44*(2), 809-856.

Carayon, P., Cassel, C., & Dzau, V. J. (2019). Improving the system to support clinician well-being and provide better patient care. *JAMA*, *322*(22), 2165-2166.

Carayon, P., Cassel, C., & Dzau, V. J. (2020). Clinician burnout and professional well-being—Reply. *JAMA*, *323*(13), 1318-1318.

Chang, Y.-C., Ku, C.-H., & Le Nguyen, D.-D. (2022). Predicting aspect-based sentiment using deep learning and information visualization: The impact of COVID-19 on the airline industry. *Information & Management*, *59*(2), Article 103587.

Cordes, C. L., & Dougherty, T. W. (1993). A review and an integration of research on job burnout. *Academy of Management Review*, *18*(4), 621-656.

Devaraj, S., Ow, T. T., & Kohli, R. (2013). Examining the impact of information technology and patient flow on healthcare performance: A theory of swift and even flow (TSEF) perspective. *Journal of Operations Management*, *31*(4), 181-192.

Ewen, R. B., Smith, P. C., & Hulin, C. L. (1966). An empirical test of the Herzberg two-factor theory. *Journal of Applied Psychology*, *50*(6), 544.

Feldman, M. S., & Pentland, B. T. (2003). Reconceptualizing organizational routines as a source of flexibility and change. *Administrative Science Quarterly*, *48*(1), 94-118.

Fornell, D. (2023). *FDA has now cleared 700 AI healthcare algorithms, more than 76% in radiology*. Health Imaging. https://healthimaging.com/topics/artificial-intelligence/fda-has-now-cleared-700-ai-healthcare-algorithms-more-76-radiology

Gallup. (2023). *Bentley-Gallup business in society report* https://www.bentley.edu/files/gallup/Bentley_Gallup_Business_in_Society_Report.pdf

Ganju, K. K., Atasoy, H., & Pavlou, P. A. (2022). Do electronic health record systems increase medicare reimbursements? The moderating effect of the recovery audit program. *Management Science*, *68*(4), 2889-2913.

Geng, F., Stevenson, D. G., & Grabowski, D. C. (2019). Daily nursing home staffing levels highly variable, often below CMS expectations. *Health Affairs*, *38*(7), 1095-1100.

Green, T. C., Huang, R., Wen, Q., & Zhou, D. (2019). Crowdsourced employer reviews and stock returns. *Journal of Financial Economics*, *134*(1), 236-251.

Greenwood, B. N., Ganju, K. K., & Angst, C. M. (2019). How does the implementation of enterprise information systems affect a professional's mobility? An empirical study. *Information Systems Research*, *30*(2), 563-594.

Han, S., Shanafelt, T. D., Sinsky, C. A., Awad, K. M., Dyrbye, L. N., Fiscus, L. C., Trockel, M., & Goh, J. (2019). Estimating the attributable cost of physician burnout in the United States. *Annals of Internal Medicine*, *170*(11), 784-790.

Heiser, S. (2019, April 23). *New findings confirm predictions on physician shortage*. AAMC. https://www.aamc.org/news-insights/press-releases/new-findings-confirm-predictions-physician-shortage

Hu, N., Pavlou, P. A., & Zhang, J. J. (2009). Why do online product reviews have a J-shaped distribution? Overcoming biases in online word-of-mouth communication. *Communications of the ACM*, *52*(10), 144-147.

Ji, Y., Rozenbaum, O., & Welch, K. (2017). *Corporate culture and financial reporting risk: Looking through the glassdoor*. SSRN. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2945745

Khairat, S., Xi, L., Liu, S., Shrestha, S., & Austin, C. (2020). Understanding the association between electronic health record satisfaction and the well-being of nurses: survey study. *JMIR Nursing*, *3*(1), e13996.

Khan, F. H., Bashir, S., & Qamar, U. (2014). TOM: Twitter opinion mining framework using hybrid classification scheme. *Decision Support Systems*, *57*(1), 245-257.

King, J., Patel, V., Jamoom, E. W., & Furukawa, M. F. (2014). Clinical benefits of electronic health record use: national findings. *Health Services Research*, *49*(1, pt2), 392-404.

Kohli, R., Devaraj, S., & Ow, T. T. (2012). Does information technology investment influence a firm's market value? A case of non-publicly traded healthcare firms. *MIS Quarterly*, *36*(4), 1145-1163.

Kroth, P. J., Morioka-Douglas, N., Veres, S., Babbott, S., Poplau, S., Qeadan, F., Parshall, C., Corrigan, K., & Linzer, M. (2019). Association of electronic health record design and use factors with clinician stress and burnout. *JAMA Network Open*, *2*(8), e199609-e199609.

Kuehn, B. M. (2023). Physicians are more burned out than ever—Here's what can be done about it. *JAMA*, *329*(10), 785-787.

Lapointe, L., & Rivard, S. (2005). A multilevel model of resistance to information technology implementation. *MIS Quarterly*, *29*(3), 461-491.

Leidner, D. E., & Gregory, R. W. (2024). About theory and theorizing. *Journal of the Association for Information Systems*, *25*(3), 501-521.

Lizano, E. L. (2015). Examining the impact of job burnout on the health and well-being of human service workers: A systematic review and synthesis. *Human Service Organizations: Management, Leadership & Governance*, *39*(3), 167-181.

Lu, S. F., Rui, H., & Seidmann, A. (2018). Does technology substitute for nurses? Staffing decisions in nursing homes. *Management Science*, *64*(4), 1842-1859.

Melnick, E. R., Dyrbye, L. N., Sinsky, C. A., Trockel, M., West, C. P., Nedelec, L., Tutty, M. A., & Shanafelt, T. (2020). The association between perceived electronic health record usability and professional burnout among US physicians. *Mayo Clinic Proceedings, 95*(3), 476-487.

Miranda, S., Berente, N., Seidel, S., Safadi, H., & Burton-Jones, A. (2022). Editor's comments: Computationally intensive theory construction: A

primer for authors and reviewers. *MIS Quarterly*, *46*(2), iii-xviii.

Moy, A. J., Schwartz, J. M., Chen, R., Sadri, S., Lucas, E., Cato, K. D., & Rossetti, S. C. (2021). Measurement of clinical documentation burden among physicians and nurses using electronic health records: a scoping review. *JAMIA*, *28*(5), 998-1008.

Murthy, V. H. (2022). Confronting health worker burnout and well-being. *New England Journal of Medicine*, *387*(7), 577-579.

NAM (National Academies of Sciences, Engineering, and Medicine; National Academy of Medicine; Committee on Systems Approaches to Improve Patient Care by Supporting Clinician Well-Being). (2019). *Taking action against clinician burnout: a systems approach to professional well-being*. National Academies Press

Nguyen, O. T., Jenkins, N. J., Khanna, N., Shah, S., Gartland, A. J., Turner, K., & Merlo, L. J. (2021). A systematic review of contributing factors of and solutions to electronic health record-related impacts on physician well-being. *JAMIA*, *28*(5), 974-984.

Novak, L., Brooks, J., Gadd, C., Anders, S., & Lorenzi, N. (2012). Mediating the intersections of organizational routines during the introduction of a health IT system. *European Journal of Information Systems*, *21*(5), 552-569.

ONC. (The Office of the National Coordinator for Health Information Technology). (2017). *Health IT Dashboard quick stats adoption*. Assistant Secretary for Technology Policy. Retrieved May 29, 2021 from https://dashboard. healthit.gov/quickstats/quickstats.php

ONC. (2020). *Strategy on reducing regulatory and administrative burden relating to the use of Health IT and EHRs final report*. https://www. healthit.gov/sites/default/files/page/2020-02/ BurdenReport_0.pdf

OpenAI. (2024). *ChatGPT large language model*. https://openai.com/

Orlikowski, W. J., Yates, J., Okamura, K., & Fujimoto, M. (1995). Shaping electronic communication: The metastructuring of technology in the context of use. *Organization Science*, *6*(4), 423-444.

O'Shea, J. (2018). *Patient-centered, value-based health care is incompatible with the current climate of excessive regulation*. Health Affairs. https://www. healthaffairs.org/content/forefront/patient-centered-value-based-health-care-incompatible-current-climate-excessive   Ragu-Nathan, T., Tarafdar, M., Ragu-Nathan, B. S., & Tu, Q.

(2008). The consequences of technostress for end users in organizations: Conceptual development and empirical validation. *Information Systems Research*, *19*(4), 417-433.

Salton, G., & Buckley, C. (1988). Term-weighting approaches in automatic text retrieval. *Information Processing & Management*, *24*(5), 513-523.

Sen, I., Quercia, D., Constantinides, M., Montecchi, M., Capra, L., Scepanovic, S., & Bianchi, R. (2022). Depression at work: exploring depression in major US companies from online reviews. *Proceedings of the ACM on Human-Computer Interaction*.

Shanafelt, T., & Kuriakose, C. (2023). Widespread clinician shortages create a crisis that will take years to resolve. *NEJM Catalyst Innovations in Care Delivery*, *4*(3). https://doi.org/10.1056/CAT. 23.0034

Sharda, R., Delen, D., Turban, E., Aronson, J., & Liang, T. P. (2014). Text analytics, text mining, and sentiment analysis. In R. Sharda, D. Delen, & E. Turban (Eds.), *Business intelligence and analytics: Systems for decision support* (10th ed., pp. 288-328). Pearson Education

Srivastava, A., Ayyalasomayajula, S., Bao, C., Ayabakan, S., & Delen, D. (2022). Relationship between electronic health records strategy and user satisfaction: a longitudinal study using clinicians' online reviews. *JAMIA*, *29*(9), 1577-1583.

Stevens, C. (2025). *"It's not okay": Oregon Sen. Jeff Merkley speaks at health care union rally as Providence strike enters second day*. KGW8. https://www.kgw.com/article/news/local/provide nce-return-negotiations-medford-newberg-health-care-workers-strike-oregon/283-04b277d8-bae7-4d0d-9045-38b564e0d846

Sullivan, T. (2018). *Why EHR data interoperability is such a mess in 3 charts*. HealthcareIT News. https://www.healthcareitnews.com/news/why-ehr-data-interoperability-such-mess-3-charts

Svetvilas, C., & Morris, M. (2023). Federal safe staffing bill introduced in House and Senate. *National Nurse Magazine*. Available at https://www. nationalnursesunited.org/article/federal-safe-staffing-bill-introduced-in-house-and-senate

Tao, J., & Fang, X. (2020). Toward multi-label sentiment analysis: a transfer learning based approach. *Journal of Big Data*, *7*, 1-26.

Tarafdar, M., Cooper, C. L., & Stich, J. F. (2019). The technostress trifecta-techno eustress, techno distress and design: Theoretical directions and an

agenda for research. *Information Systems Journal*, *29*(1), 6-42.

Tarafdar, M., Tu, Q., Ragu-Nathan, B. S., & Ragu-Nathan, T. S. (2007). The impact of technostress on role stress and productivity. *Journal of Management Information Systems*, *24*(1), 301-328.

Tremblay, M. C., Kohli, R., & Forsgren, N. (2021). Theories in flux: Reimagining theory building in the age of machine learning. *MIS Quarterly*, *45*(1), 455-459.

Twigg, D. E., Whitehead, L., Doleman, G., & El-Zaemey, S. (2021). The impact of nurse staffing methodologies on nurse and patient outcomes: A systematic review. *Journal of Advanced Nursing*, *77*(12), 4599-4611.

Urquhart, C. (2022). *Grounded theory for qualitative research: A practical guide.* SAGE.

Wachter, R. M., & Howell, M. D. (2018). Resolving the productivity paradox of health information technology: A time for optimism. *JAMA*, *320*(1), 25-26.

WHO (World Health Organization). (2019). *Burn-out an "occupational phenomenon": International Classification of Diseases.* https://www.who.int/news/item/28-05-2019-burn-out-an-occupational-phenomenon-international-classification-of-diseases

Wolpin, J., Burke, R. J., & Greenglass, E. R. (1991). Is job satisfaction an antecedent or a consequence of psychological burnout? *Human Relations*, *44*(2), 193-209.

Wowak, K. D., Handley, S., Kelley, K., & Angst, C. M. (2024). Strategic sourcing of multicomponent software systems: The case of electronic medical records. *Decision Sciences*, *55*(3), 227-244.

Yan, Q., Jiang, Z., Harbin, Z., Tolbert, P. H., & Davies, M. G. (2021). Exploring the relationship between electronic health records and provider burnout: a systematic review. *JAMIA*, *28*(5), 1009-1021.

Zheng, K., Haftel, H. M., Hirschl, R. B., O'Reilly, M., & Hanauer, D. A. (2010). Quantifying the impact of health IT implementations on clinical workflow: a new methodological perspective. *JAMIA*, *17*(4), 454-461.

Appendix A

Figure A1. Sample Glassdoor Review

Appendix B

Table B1. Coding of Cons Keywords

1	2	3	4	5	6	7	8	9	10	11	12	13
Routines aspects	**Health and well-being**	**Job security and stability**	**Compensation and benefits**	**Parking and access**	**Career development**	**Organizational factors**	**Admin and leadership**	**Safety**	**Infrastructure**	**Cafeteria**	**IS/EHR**	**Training and resource**
scheduling issues	stress	turnover	raise	parking	advancement	communication	administration	unsafe	equip	cafeteria	chart	training
flexibility	work life balance	job Security	money	location	growth	support	leadership		technology		paper	resource
staffing issues	overwork	job stability	benefit	home	opportunity	competition	bureaucracy		acuity		paperwork	
change	overwhelmed	retention	health insurance	drive	skill	politics	dictatorship				electronic	
understaff	load	exit	salary	traffic	promotion	union					computer	
float	workload		underpaid	walk	education	people						
time	burn		insurance	distance	growth	drama						
short staff	tough		health		career	unprofessional						
covid	burnout		pay		development	rude						
staff patient ratio	frustrate		wage			respect						
shift	mental		vacation			toxic						
unorganized	challenging		sick			unfair						
break	holiday		reward			hostile						
chaotic	weekend		overtime			clique						
inefficiency	long hours		per diem			clicky						
utilization	hectic		diem			recognition						
pandemic	hardship		loan			role						
team	busiest					nepotism						
	dishearten					bankruptcy						
						hierarchy						
						profit						
						teamwork						

Table B2. Coding of Pros Keywords

1	2	3	4	5	6	7	8	9	10	11	12
Routines aspects	**Health and well-being**	**Job security**	**Compensation and benefits**	**Parking and access**	**Career development**	**Organizational factors**	**Admin and leadership**	**Safety**	**Infrastructure**	**Cafeteria**	**IS/EHR**
schedule	balance (work life)	security	salary	location	opportunity	patients, children, and families	supervisor	safe	level 1 trauma	cafeteria	computer
shift	weekend	stable	benefits	parking	growth	friendliness	leadership		magnet status	food	automation
flexibility	time		overtime	close	education	family atmosphere	mission		equipment	food truck	
workflow	hours		free	home	tuition	staff, coworkers, people, colleagues	administration		technology		
team	clean		insurance	access	reimbursement	communication	union		network		
camaraderie	holiday		health	hometown	career	culture	director				
help	stress (free)		vacation	drive	learn	environment	boss				
efficient	Well-being		compensation	beach	grad	competition	director				
collaboration			incentive		teach	diversity, inclusive	support				
			reward		training	respect					
			perk		school	autonomy					
			paycheck		orientation	moral					
			raise		encourage	compassion					
			bonus		knowledge	accommodating					
			pension		promotion	fair					
			dental		advancement	professionalism					
			retirement		mentor	appreciation					
			reimbursement		progress	challenge					
			sick		recognition	fulfilling					
			diem		intern	engaging					
			loan		student	feedback					
						union					
						pioneer					
						teamwork					

Appendix C

Table C1. Sample of Glassdoor Reviews to Validate Our Hypotheses

Review no.	Verbatim quotes from Glassdoor reviews with routines issues underlined	Mitigation strategy
1	*There are way too many computer programs to run at once. When I get to my computer in the morning, I have to open 7-9 windows. Rather than invest in one program that does it all, they keep adding more programs that each have their own function. Billing, scheduling, clinic notes, operative notes, insurance checking software--they all have their own program. Some of the programs work together, but not in an efficient way.* (Other Clinical; August 15, 2012)	Workflow integration, documentation integration
2	*computerized charting goes too far. you must <u>drag a heavy cow wherever you go and scan every bracelet and every pill, eye drop, and ointment</u>. it doesn't matter if the scan bar is smudged and won't. you will be disciplined. you must join a committee which exists just to bring it closer to magnet status. if you forget to chart one turn or one piece of education, you will receive an e mail. if you do not lable one tubing, you ill also receive an email… your whereabouts will be known at ALL <u>times</u> because you will wear a "nurse locater," <u>along with a personal phone which will ring constantly</u>. most days you will <u>work</u> til you drop from exhaustion, as soon as one discharges you will get two more as we cannot say no to ER.* (Nurse; October 31, 2012)	Workflow integration, documentation integration
3	*Changes constantly, which may not actually be a con. Felt some of the new computer programs actually hindered instead of improved patient care. Took a lot of time away from actual patient care.* (Nurse; November 21, 2012)	Workflow integration, documentation integration
4	*<u>Productivity</u> and patient satisfaction are so emphasized that the nurses are sometimes stressed to the max… Most RN's, except in a few select areas feel overworked and overwhelmed by all the demands. However, this may be the way healthcare is going and not just a problem at our healthcare system. Our computer program, Centricity, is the <u>slowest</u>, most poorly put together EMR that I have used. In the ICU we still have a paper flow sheet and a paper MAR, besides the computerized one—which is ridiculous.* (Nurse; 30 Dec 2012)	Workflow integration, documentation integration
5	*The EMR is a nightmare made of 4 (5, 6?) different systems that don't communicate well (or at all) with one another. This is all in one hospital!* (Physician; May 14, 2013)	Workflow integration, documentation integration
6	*Wraparound care; fantastic online medical record system and <u>coordination</u> between departments; newer facility* (Other Clinical, 10 Aug 2013)	Workflow integration
7	*Not one integrated EMR leading to lots of confusion.* (Nurse; November 14, 2013)	Workflow integration, documentation integration
8	*Lack of <u>efficiency</u>. Tunnel vision leadership. Very <u>outdated processes</u>. Like going back in time 20 years! I was overwhelmed with how behind they were in terms of electronic medical charting and their overall approach to patient care.* (Nurse; November 21, 2013)	Workflow integration, documentation integration
9	*<u>No breaks</u>, poor compensation, poor management, knee-jerk reactive policies, <u>overburdening</u> nurses. Horrible <u>tracking</u> of acuity; our med/surg floor was regularly assigned patients that should have been in stepdowns. We had constant rapid responses because of this, because asking a supervisor to move them never worked; they'd rather argue with you or tell you to convince the doctor for a transfer order. Breaks are never a guarantee, even lunch breaks. Only techs get guaranteed breaks, because they're part of a union. We would have to carry 6 patients with high acuities with no breaks, and then get in trouble if we had overtime, even incremental overtime. We were threatened with layoffs if the overtime didn't stop, <u>so many nurses had to chart or do patient care off the clock in order to keep their jobs</u>. <u>You have to travel with every patient that leaves the floor</u> (Ie, xray, MRI, CT, stress test, etc) because even though our transporters are BLS certified, one time a patient coded during transport. This is just one example of the knee-jerk reactive policies put in place. When you have six patients, this sort of thing takes time away from your other patients, your ability to finish patient care and documentation, and puts everyone at risk.* (Nurse; December 16, 2013)	Workflow integration, documentation integration

10	*too many <u>conflicting</u> computer programs for record keeping, outdated technology & office equipment.* (Other Clinical; March 6, 2014)	Documentation integration
11	*...Top leadership either does not know, or does not care, that <u>certain functions vital to providing patient care (including laboratory result reporting, pharmacy, archaic and cumbersome computer systems, etc.) barely function</u>—it is only from the consistent and laborious work-arounds by clinicians that care is even provided to the patients...* (Physician; March 25, 2014)	Workflow integration
12	*At times, we would have to go from one med room to the other to get supplies or medications. So when talking about <u>time management and efficiency</u>, this issue is a great example of <u>wasting valuable patient and charting time</u>.* (Nurse; July 23, 2014)	Workflow integration
13	*Constant management changes. Understaffing of nurses and clinical technicians. Poor <u>coordination</u> between departments means that you have to get someone to keep calling to get something done.* (Other Clinical, June 22, 2015)	Workflow integration
14	*Being so large made it impossible to implement <u>hospital or department-specific solutions</u>. Management was very out of touch, might do token maneuvers such as giving out pie or cookies to staff, but if you don't reward people financially for their extra work, degrees, or certifications, it's useless. Some departments put nurses on-call for low census, which could be very damaging to people financially. Employees afraid to speak up. Very low tuition reimbursement. They have been trying to implement a new electronic charting system but are having <u>trouble rolling it out in all facilities.</u> There are currently an <u>insane number of charting, data, compliance and education platforms</u> that must be <u>utilized</u> by staff, many of which are badly outdated. Had many <u>issues with the health insurance and billing</u>.* (Nurse; October 2, 2015)	Workflow integration, documentation integration
15	*...During my reviews (since I was still in my probation period) I was told I need to pick up more shifts since I am required to work 80% of shifts offered to me... They wanted me to be a <u>robot and work everyday</u>! I was also having some health issues that were mentioned to management and they just didn't care and just <u>wanted me to be at work and not call in sick</u>. At the end of my probation period, I was let go since I wasn't complying with their requirements. Honestly, I am so happy that happened. Another great big con is that <u>they have so many different systems they use for everything, meaning you need a different password for everything.</u> You also are not required to change any passwords, which is crazy because they are responsible for protecting patients privacy! That means the systems can be hacked more easily than others!* (Other Clinician; January 26, 2016)	Workflow integration, documentation integration
16	*Nurses aren't allowed to be sick; you will be guilted if you call out for a sick day. <u>The hospital uses Meditech and the ER uses Epic.</u> They are expanding Meditech but still using paper charting until a new computer system is put into place which I believe is supposed to be Epic in the long term. Sometimes it feels like day shift vs night shift <u>when in reality nursing is 24 hours a day</u>.* (Nurse; March 8, 2016)	Workflow integration
17	*Excellent work environment and <u>collaboration</u> between doctors, surgeons, pharmacist, techs, management, and RNs, etc...* (Nurse; March 15, 2016)	Workflow integration
18	*...Upper management also seems to take joy and pleasure in over <u>complicating tasks</u>, instead of maximizing <u>efficiency</u> with all the technology they utilize...* (Nurse; March 18, 2016)	Workflow integration, documentation integration
19	*...Feel like you are working for Walmart now with Ascension, down to being called Associates, not doctors. This is insulting. Poor retirement and health benefits. <u>Moving to fragmented new electronic medical record system, separate systems for hospitals versus clinics rather than integrated system.</u> In other words, <u>chaos</u> and seemingly poor upper management/lack of vision on all levels as we transition to merge with many other groups to form Ascension Medical Group Wisconsin.* (Physician; March 30, 2016)	Workflow integration, documentation integration
20	*"... This ER is very very hooked up as far as resources. We have CT scan, radiology, lab, ultrasound, and nearly every specialty in house. We get results fast and can offer very high quality care to our patients. On weekend nights the ER staff is excellent. The doctors are very knowledgeable as well as RNs, techs, and all support staff. It is more like a family than a work place. Very great place to work."* (Nurse; June 29, 2016)	Workflow integration
21	*<u>Redundant</u> work. Double and triple charting things b/c the management wants to implement new computer programs, on top of existing ones, that don't really affect patient care at all; it is essentially just carrying over to the second program the same information that exists in the first program...* (Other Clinician; November 26, 2016)	Documentation integration

22	*Poor use of EMR. <u>Lack of collaboration between departments</u>. behind-the-times for use of tech. Overlake operates as if it's in the 1950s—Physicians are Kings, all else are "support staff." They have not figured out how to develop nursing, and do not allow for thinking outside the box. Lack creativity in <u>problem solving</u>. Rely on management and physicians to determine solutions.* (Nurse; June 28, 2017)	Workflow integration
23	*Constant need for staffing as supply of RN/BSN is not enough When inpatient population is high. Then manager may not be sensitive to the needs of the unit and <u>pile on work duties</u> in the face of staff shortages. Due the large nature of the corporate structure, many decisions that directly affect the employee impact negatively on <u>work performance</u>. <u>Transition and changes in policies and procedures along with new technologies can be upsetting in the day to day efficiency of the unit</u>.* (Nurse; October 6, 2017)	Workflow integration
24	*Patient load was manageable. The orientation of the <u>unit was well organized</u> and patient care materials and meds were <u>easily accessible</u>. Surround sight of the unit. Employee to patient ratio was more than acceptable. Nurses did not feel over worked. Patient care was important. <u>Team and unit meetings</u> were held on the floor and were <u>not time consuming</u> as to not take too much time away from patient care.* (Nurse; December 6, 2017)	Workflow integration, documentation integration
25	*"Integrated care delivery model is aspirational for many Leading edge on EMR integration, quality care management and coding, etc support Great benefits"* (Physician; March 8, 2018)	Documentation integration
26	*There was widespread pandemonium and <u>confusion</u> during the iCentra (Intermountain's version of Cerner) rollout. The system continues to be very clumsy, unfriendly, and is beta at best. A lot of the travelers remarked how much more complicated iCentra was than Cerner out-of-the-box. I sense that this software will be a millstone around Intermountain's neck sapping resources and frustrating clinicians and RNs for years to come... Aides and RNs bite their tongue during staff meetings in which they are taken to task for late clock-outs or missing some new <u>procedure or protocol</u> of dozens that were changed within the week. Management refuses to acknowledge the fact that the <u>systems and operations</u> frequently make it impossible to get everything done according to protocol. The buzzword "time management" is thrown out as the solution to all problems. The last 5 times I've worked I've never been able to take a lunch. I dread going into work, actually. This is actually quite sad, because I have such meaningful experiences with my patients...* (Nurse; April 21, 2018)	Workflow integration
27	*... I am incredibly disappointed that although we are getting a new computer charting system, we are keeping our old, outdated paper charts as well. The paper chart is a constant source of <u>confusion and stress on every unit</u>. Nurses, secretarys and managers are often seen huddled around the chart attempting to decipher hand written orders for important procedures, labs, and medications. Nurses can rarely read MD progress notes leaving us uninformed and confused regarding plans for care. <u>Orders are missed</u> regularly because they are written on the incorrect page, or the chart is not "flagged," creating <u>delays in care</u>. It is a <u>dangerous, time wasting, confusing system</u>.* (Nurse; July 6, 2018)	Workflow integration
28	*Lower pay for RNs compared to other similar hospitals; recently <u>changed EHR</u> from Hoag-owned SCM to Providence-owned Epic build, making it really challenging to have <u>optimization requests fulfilled</u> through the many layers of approval within the vast Providence network though they are HIGHLY needed at Hoag.* (Nurse; August 23, 2018)	Workflow integration
29	*can't figure out who should do a certain task? give it to the nursing staff—<u>SO. MANY. FORMS</u>. every week some form would be added for <u>double, triple charting, they take away your resources but then want you to answer that call bell faster ... because its all about the HCAPS</u>—lack of security and their response. combative male patient and only you and other female employee at night, it takes a act of congress to try to get them to even come round on the units—two words: for profit.* (Nurse; December 3, 2018)	Workflow integration, documentation integration
30	*...There's always a new program or initiative to make a nursing "easier" but usually results in additional charting and <u>less time</u> for actual patient care.* (Nurse; January 3, 2019)	Workflow integration, documentation integration
31	*I am never approached regarding <u>productivity</u> and I am autonomous in my treatment decisions. Recommendations and concerns considered and acted on immediately if appropriate. <u>Continuous improvement on procedures and environment following employee recommendations</u>. CEO seeks interactions with employees and facility creates employee appreciation activities (i.e. Christmas tea party, outdoor picnic). I feel comfortable talking to our Supervisor, Director, and Department Manager on an individual level. We are kept up to date with Fairview policies, changes, and insurance requirements. <u>Documentation software aids in efficiency and ease of documentation</u>. Definitely supportive environment and highly recommend.* (Other Clinical; January 6, 2019)	Workflow integration, documentation integration

32	*With recent EMR upgrade to Cerna, there has been a number of employees leaving the hospital/outlying offices due to the <u>poor functionality of the system</u>. This includes staff from all levels, including providers. Con #2-poor management in my setting contributed to my resigning from the practice as well.* (Nurse; March 28, 2019)	Workflow integration, documentation integration
33	<u>*Charting*</u> *can be overwhelming and frustrating.* <u>*Frequent updates*</u> *on EHR.* (Nurse; June 7, 2019)	Documentation integration
34	*They really could have purchased EPIC computer system to be uniform with all the other large entities in the area. It's a good system and it would have helped <u>streamline</u> employee onboarding since most employees are coming from EPIC systems it would have cut back on the training required for these new employees.* (Nurse; June 13, 2019)	Workflow integration, documentation integration
35	*Patient centered environment with accessible tools and resources to provide <u>optimal medical care and treatment</u>. Professional interdisciplinary team. <u>Effective communication throughout entire hospital</u>. Continuing education opportunities. Career development opportunities.* (Other Clinical; April 9, 2020)	Workflow integration
36	*Patient focused <u>collaborative workplace</u> Administration transparency <u>Operational efficiency</u>* (Physician; June 2, 2020)	Workflow integration
37	*...I've seen charge nurses regularly <u>leave 1-2 hours after their shift has ended due to the number of emergencies and reports they need to attend to</u>... While it has great patient amenities and operating rooms, the layout of this enormous building makes it difficult to find help or devices. Unlike in Tisch where you could easily look into the hallway to request help, Kimmel's enormous hallways and dispersed nursing stations make it difficult to see anyone. It sometimes takes walking an entire lap around the building to find a single device. short-sighted management team non-competitive wage scale no drive for <u>increased quality or efficiency</u>* (Nurse; October 13, 2020)	Workflow integration, documentation integration
38	*Small department= more <u>workload</u> on each person. Multiple charting/documentation systems to learn and use. Unrealistic expectations of <u>daily tasks</u> to be performed by management.* (Nurse; November 26, 2020)	Documentation integration
39	*...Very little <u>team support</u>. Often do not get breaks. Breaks are interrupted. You can field 30 Vocera and telephone calls in one "lunch." Charge nurses will try to give you a new patient at the end of your <u>shift</u> when you need to complete your <u>charting</u>. This often leads to <u>staying over an hour late past your 12 1/2-hour shift</u>.* (Nurse; December 17, 2020)	Workflow integration, documentation integration
Note: Quotes are mostly not trimmed and present the complete contextual information of the review.		

Appendix D

Table D1. Definition of Healthcare Applications Considered in this Study

App. no.	Application name	Definition	Definition source
1	Emergency room (ER)	An application that assists emergency department clinicians and staff in the critical task of managing patients quickly and efficiently; directs each step of the patient management, patient flow, and patient documentation process, including triage, tracking, nursing and physician charting, disposition, charge capture, and management reporting.	HIMSS; Category = Clinical systems
2	Laboratory Information System (RIS)	An application to streamline the process management of the laboratory for basic clinical services such as hematology and chemistry. This application may provide general functional support for microbiology reporting but does not generally support blood bank functions. Provides an automatic interface to laboratory analytical instruments to transfer verified results to nurse stations, chart carts, and remote physician offices. The module allows the user to receive orders from any designated location, process the order and report results, and maintain technical, statistical, and account information. It eliminates tedious paperwork, calculations, and written documentation while allowing for easy retrieval of data and statistics.	HIMSS; Category = Laboratory
3	Radiology Information Systems (RIS)	An automated radiology information system (RIS) manages the operations and services of the radiology department. The functionality includes scheduling, patient and image tracking, and the rapid retrieval of diagnostic reports. The RIS can be integrated with the hospital information system (HIS) and a picture archive and communication system (PACS) to provide an efficient environment for users to collect, process, and manage data.	HIMSS; Category = Radiology and PACS
4	Admission Transfer Discharge (ADT)	Also known as Patient Registration. An application that automates the hospital's patient registration function in an online, real-time mode. The system includes online census, preregistration, patient history, patient admission, discharge, and admission discharge transfer functions.	HIMSS; Category = Revenue cycle management
5	Intensive Care Unit Applications (ICU)	An application that provides for the automated clinical documentation and protocol intervention management provided by intensive care or critical care professionals. This system also captures the data output from all medical devices monitoring the patient's clinical status. Order entry, clinical decision support, clinical documentation (e.g. flow charting, medication administration), and results reporting are representative application components of an intensive care/critical care system.	HIMSS; Category = Clinical systems
6	Operating Room Applications (OR)	Also known as Surgery (includes pre- and post-operative). An application to specifically automate the functions of the surgical suite. The application must also automate scheduling of surgical cases, produce schedules and case records, generate daily, monthly, and year-to-date statistics, provide inventory control, and maintain a permanent database pertaining to staff members, rooms, procedures, and capital equipment. May also include pre-operative clinical documentation.	HIMSS; Category = Clinical systems
7	Labor and Delivery Room Applications (LDR)	Also known as Obstetrical Systems. An application designed to manage the clinical care services provided by the labor and delivery department. These applications are usually interfaced to devices such as fetal monitors.	HIMSS; Category = Clinical systems
8	Order Entry (OE)	Also known as Order Communication/Results. An application that allows for entry of orders from multiple sites including nursing stations, selected ancillary departments, and other service areas; allows viewing of single and composite results for each patient order. This function creates billing records as a by-product of the order entry function.	HIMSS; Category = Electronic medical record
9	Electronic Medicine Administration Record (EMAR)	A record of all medications given to an individual patient, which nurses, physicians, and pharmacists are able to view. This environment requires the tight coupling of data flows between CPOE, pharmacy, and nursing medication administration records. EMAR is an electronic record keeping system that documents every drug taken by a patient during a hospital stay. This application supports the five rights of medication administration (right patient, right medication, right dose, right time, and the right route of administration) by utilizing bar coding functionality with pharmacy medication dispensing and nursing	HIMSS; Category = Nursing

		medication administration services. This functionality is implemented to reduce medication errors. This functionality requires tightly coupled data flows between the CPOE, pharmacy, automated dispensing machines, robotic devices, and nursing medication administration applications. Medical errors are reduced, drug inventory costs are reduced, and billing is more accurate.	
10	Clinical Documentation (CD)	An application that allows clinicians to chart treatment, therapy, and vital sign results for a patient. This application provides the flow sheets and care plan documentation for a patient's course of therapy.	HIMSS; Category = Nursing documentation
11	Infection Surveillance (IS)	Also known as Outcomes and Quality Management. An application that provides a clinical data set utilized in monitoring overall performance, efficiency, cost, and quality of clinical care by analyzing, comparing, and trending information of detailed clinical practice patterns and parameters. Example: To reduce infections post-operation, the hospital will gather data regarding broad or specific patients and can narrow down areas for improvement based on the data obtained.	HIMSS; Category = Nursing
12	Patient Acuity (PA)	Also known as Nurse Staffing. An application that automates decisions about staffing, nursing stations, and scheduling nurses' time. May include functions that enable a hospital to quickly review and generate its nurse scheduling; adjust staffing and scheduling based on patient volume, acuity, and staff ability; keep records for budgeting; produce management reports on productivity and census; and maintain records on personnel qualifications.	HIMSS; Category = Nursing
13	Clinical Data Repository (CDR)	A centralized database that allows organizations to collect, store, access, and report on clinical, administrative, and financial information collected from various applications within or across the healthcare organization that provides healthcare organizations an open environment for accessing/viewing, managing, and reporting enterprise information.	HIMSS; Category = Electronic medical record
14	Clinical Decision Support System (CDSS)	An application that uses preestablished rules and guidelines, that can be created and edited by the healthcare organization and integrates clinical data from several sources to generate alerts and treatment suggestions. Enter six levels of CDSS here as examples. Example: All patients who have potassium levels below 2.5mg% should not have a cardiac glycoside. The physician would enter a prescription for cardiac glycoside into the system, and the system would display a pop-up alert warning that the patient should not be given this medicine due to their low level of potassium.	HIMSS; Category = Electronic medical record
15	Computerized Physician Order Entry (CPOE)	CPOE (Computerized Practitioner Order Entry) or POE (Practitioner Order Entry). An order entry application specifically designed to assist practitioners in creating and managing medical orders for patient services or medications. This application has special electronic signature, workflow, and rules engine functions that reduce or eliminate medical errors associated with physician ordering processes.	HIMSS; Category = Electronic medical record
16	Physician Documentation (PD)	A physician documentation application in healthcare IT is a software tool designed to facilitate the recording, management, and retrieval of patient information by physicians. These applications are integral to electronic health record (EHR) systems and aim to improve the efficiency, accuracy, and accessibility of medical documentation.	(OpenAI, 2024); Category = Electronic medical record
17	Physician Portal (PP)	A physician portal application in healthcare IT is a web-based platform that allows healthcare providers to access and manage patient information and perform various clinical and administrative tasks. These portals are designed to improve the efficiency of healthcare delivery, enhance communication among providers, and facilitate better patient care.	(OpenAI, 2024); Category = Electronic medical record
18	Patient Portal (PtP)	The Patient Portal is a secure, web-based application that allows patients to access their medical records anytime and anywhere. The basic functions available to patients include the following: reviewing summary reports from providers, checking medication lists, requesting medication advice and prescription refills, scheduling appointments online, viewing lab tests and results, exchanging secure messages with providers, receiving personalized health reminders and notifications about test results and upcoming appointments, paying medical bills online, checking allergy lists and immunization history, and disseminating patient educational resources.	(Bao et al., 2020); Category = Electronic medical record

Table D2. Application Integration Configurations Tested in this Study

WI and DI applications configurations	Applications included
WI 1	ER+ICU+LDR+OR+RIS+LIS
WI 2	ER+ICU+LDR+OR+RIS+LIS+ADT
WI 3	ER+ICU+LDR+OR+RIS+LIS+ADT+OR Scheduling
WI 4	ER+ICU+LDR+OR+RIS+LIS+ADT+OR Scheduling+OE+CD+EMAR
WI 5	ER+ICU+LDR+OR+RIS+LIS+CPOE+OE
WI 6 (Nurse Scheduling)	PA+Nurse Staffing/Scheduling+ADT+Bed Management
WI 7 (Nurse Scheduling)	PA+Nurse Staffing/Scheduling+ADT+Bed Management+ Staff Scheduling
WI 8 (Nurse Scheduling)	ADT+Bed Management+ Staff Scheduling
DI 1	CDR+CDSS+CPOE+OE+PD
DI 2	CDR+CDSS+CPOE+OE+PD+PP+PtP
DI 3	CDR+CDSS+CPOE+OE+PD+PP+PtP+IS+CD+EMAR
DI 4	CDR+CDSS+CPOE+OE+PD+PP+PtP+IS+CD+EMAR+PA
DI 5	IS+PA+ Nurse Staffing/Scheduling+CD+EMAR
Note: Please refer to Table D1 for acronym definitions.	

Appendix E

Table E1. Examples of Dependent Variable Construction

Job title group	Extracted routines: Sentences from pros	Extracted routines: Sentences from cons	Pros words: Included	Pros: Positive	Cons words: Included	Cons: Negative	Combined sentiment: With routines
Other Clinical		very inefficient work place, inbred as in osu grads given supervisory and mgt positions so no influx of new ideas, no incentive for improvement.	0	0	2	0.625	-0.625
Nurse		management had no interest in making changes to actually fix broken/inefficient systems.	0	0	1	0.125	-0.125
Nurse		everybody is stressed and with the work load and inefficient documentation software, there is no time for basic patient care.	0	0	1	0.5	-0.5
Physician		large hospital system makes changing status quo difficult, terrible computer systems for patients records, billing, ect can cause headaches communicating between departments.	0	0	2	1.375	-1.375
Other clinical		bad communication between departments, inefficient spending, lazy people that don't do their job with no supervision, lots of yelling and finger pointing, bad management.	0	0	4	2	-2
Other clinical		bad communication between departments, inefficient spending, lazy people that don't do their job with no supervision, lots of yelling and finger pointing, bad management.	0	0	4	2	-2
Nurse		that is from people who have the job of making the hospital more efficient except it is not more efficient because more education training is required with all the constant changes. they like to change things up just as the kinks get worked out.	0	0	1	0.625	-0.625
Nurse	in an emergency a team can count on each other to get necessary things completed in a very efficient manor for the well being of the	14 hour night shifts make it very difficult to have a life outside of work.	6	2.056	1	0.75	1.306

	patient. camaraderie , everyone works well as a team.					
Nurse		*large department, understaffed *communication could improve *rushed feeling, not enough support or teamwork.	0	0	2	1.375	-1.375
Nurse	you are a respected member of a team. team players and supportive of one another.	the discharge process makes discharge planning almost impossible! the various medical teams (pa's, residents, np's, attending's, etc) utilize ineffective communication when it comes to the needs of the patients at the time of discharge. mon-fri schedule is terrible for such a busy work flow.	2	1.125	5	2.5	-1.375
Other clinical		slow to resolve problems, lack of communication between departments, lack of culture.	0	0	1	0.625	-0.625
Other clinical	competitive pay, flexible pto, supportive culture, core values, quality driven.	limited workspace, inefficient it/helpdesk support.	3	0.875	1	0.5	0.375
Nurse	teamwork is emphasized and the interdepartmental collaboration is exceptional. patient to nurse ratio allows for a concentrated level of care for each one.		5	1.25	0	0	1.25
Other clinical	each department works as an individual team, yet works as a unit with the other departments.		1	0.25	0	0	0.25
Other clinical	flexible with schedules. group seems to practice their mission statement.	company has a lot of updating to do, workflows are not efficient.	2	0.625	1	0.625	0
Other clinical		inefficient, archaic work flows, poor work-life balance, too much administrative burden with decisions being made that make no sense at times, too much top down management	0	0	7	3.25	-3.25

		at times, slow growth opportunities, lower than average salaries, burnout is high.					
Physician		highly inefficient. very bureaucratic, things move very slow.	0	0	1	0.5	-0.5
Nurse	great teamwork at unit level as well as interactions with other teams fair working environment, our department values nursing and nursing role and impact, hence we are on our way to becoming a magnet designated campus.		2	0.625	0	0	0.625
Other clinical	management, specifically, was very caring and compassionate to patients and their team of employees.	more communication between separate departments would help the overall workflow and create more meaningful interaction between employees.	4	1.25	1	0.5	0.75
Other clinical		feminine workplace imbalance petty behavior high stress to meet ever changing workflow ideas.	0	0	3	1.5	-1.5
Nurse	pretty flexible schedule. 3-12 hour shifts.	the communication is very poor, and rarely do you have the help needed to actually be a compassionate care giver.	1	0.375	3	1.125	-0.75
Other clinical		repetitious workflow that and sometimes, very difficult patients.	0	0	2	1	-1
Other clinical	management is diligent and open to suggestions about how to improve the work environment and how to help everyone do their job efficiently.	staffing can be an issue some days but the camaraderie will help you get through a shift.	4	1.5	0	0	1.5
Other clinical	coworkers teamwork flexible schedule culture inclusivity growth opportunity.		2	0.875	0	0	0.875

		promised changes are slow to happen if they ever do, management does not side with rn's and there is a lot of "us vs them" between units, nurses and doctors, and axillary staff.	0	0	1	0.625	-0.625
Nurse	good multidisciplinary collaboration and teamwork.		1	0.75	0	0	0.75
Other clinical		lack of modern technology to help with training and making work flow more efficient.	0	0	1	0.25	-0.25
Nurse		lack of efficient epic training, i've met several unsupportive and entitled nursing staff, favoritism, workload, lack of online access to schedule, and your paystubs.	0	0	4	1.75	-1.75

Appendix F. Additional Analyses

In this appendix, we examine the heterogeneous impact of WI and DI. First, we consider different clinician types, specifically nurses and other clinicians. According to the NAM report (NAM, 2019), there is limited understanding of job satisfaction and well-being among disparate clinicians, such as nurses, laboratory technicians, and radiologists. Therefore, examining the differential effects of WI and DI by clinician type can offer more nuanced insights. Due to the low prevalence of physician reviews, we removed them to avoid outlier effects and performed subsample analyses to examine the effect of WI and DI among nurses and other clinicians.

Table F1. Clinician Sentiment by Clinician Types

DV	(1)	(2)	(3)	(4)
	Clinicians' sentiment toward routines			
Subsample	Nurses		Other clinicians	
WI	0.130*		0.217**	
	(0.071)		(0.100)	
DI		0.077		0.148
		(0.083)		(0.117)
Constant	-2.154**	-2.239**	-0.683	-0.853
	(0.939)	(0.944)	(1.382)	(1.391)
Observations	5,036	5,034	2,718	2,716
R-squared	0.319	0.319	0.371	0.370
Hospital FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Review controls	Yes	Yes	Yes	Yes
Hospital controls	Yes	Yes	Yes	Yes
Regional controls	Yes	Yes	Yes	Yes

Note: Other control variables are included in the estimation and not reported for brevity. Robust standard errors are presented in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The results are presented in Table F1, where we observe a significant impact of WI in increasing clinician sentiment for both nurses and other clinicians (Columns 1 and 3), while DI remains insignificant (Columns 2 and 4). Notably, the effect size of WI is higher for other clinicians. This may be because other clinicians are more concerned with inter-departmental workflow and communication, whereas nurses' routines involve both workflow and patient documentation activities (as shown in Figure 6). The following Glassdoor reviews highlight the coordination work expected from other clinicians.

> *Constant management changes. Understaffing of nurses and clinical technicians. Poor coordination between departments means that you have to get someone to keep calling to get something done.* (Other Clinical; June 22, 2015)

> *Technology-wise, company is 15-20 years behind which creates challenges in being as efficient as possible and physicians still write 100% of orders on paper rather than CPOE. Departments seem to operate in silos creating not the most positive culture especially as it regards incident reporting, which is not kept anonymous…* (Other Clinician; August 18, 2016)

Next, we examine the heterogeneous impact of WI and DI on clinician sentiment by hospital ownership types. Angst et al. (2017) documented heterogeneity in application integration among different types of hospitals. Similarly, we expect varying effects of sourcing strategies, contingent on organizational characteristics such as the for-profit status, teaching intensity, and magnet status. Since our dataset primarily focuses on hospital ownership, we analyze its role in shaping these effects. Our findings reveal that WI has a significant positive impact on clinician sentiment in the case of not-for-profit hospitals, whereas no such effect is observed in for-profit or government hospitals (Table F2 Columns 1-3). The following review illustrates the contrast in workflow experiences between a for-profit hospital and a teaching hospital, which, in this case, appears to be not-for-profit. Consistent with our previous findings, DI does not have a significant impact on clinician sentiment (Columns 4-6).

> *The takeover of UA happened during my training, I would not have chosen to work for Banner. The have no experience with a large teaching hospital, and their for profit policies don't really work in a teaching hospital which has different priorities (like a resident is not always going to be able to discharge someone before noon when they are also admitting). Crappy benefits compared to when UA was in charge. Lots of propaganda, and irrelevant required computer training modules.... Very high turnover for nurses in certain departments.* (Physician; June 23, 2018)

Table F2. Clinician Sentiment by Hospital Types

DV	(1)	(2)	(3)	(4)	(5)	(6)
	Clinicians' sentiment toward routines					
Subsample	**Not for profit**	**For profit**	**Government**	**Not for profit**	**For profit**	**Government**
WI	0.133**	0.106	0.007			
	(0.058)	(0.223)	(0.178)			
DI				0.079	0.267	0.002
				(0.070)	(0.209)	(0.204)
Constant	-1.388*	-7.044***	-1.153	-1.463*	-6.978***	-1.157
	(0.767)	(2.506)	(2.592)	(0.772)	(2.502)	(2.600)
Observations	6,734	905	924	6,734	903	924
R-squared	0.267	0.448	0.373	0.267	0.451	0.373
Hospital FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Review controls	Yes	Yes	Yes	Yes	Yes	Yes
Hospital controls	Yes	Yes	Yes	Yes	Yes	Yes
Regional controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: Other control variables are included in the estimation and not reported for brevity. Robust standard errors are presented in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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