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Scoping review: Positive and negative impact of technology on clinicians

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ABSTRACT

Background: Unnecessary electronic health record (EHRs) documentation burden and usability issues have negatively impacted clinician well-being (e.g., burnout and moral distress).
Purpose: This scoping review was conducted by members from three expert panels of the American Academy of Nurses to generate consensus on the evidence of both positive and negative impact of EHRs on clinicians.
Methods: The scoping review was conducted based on Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) Extension for Scoping Reviews guidelines.
Results: The scoping review captured 1,886 publications screened against title and abstract 1,431 excluded, examined 448 in a full-text review, excluded 347 with 101 studies informing the final review.
Discussion: Findings suggest few studies that have explored the positive impact of EHRs and more studies that have explored the clinician's satisfaction and work burden. Significant gaps were identified in associating distress to use of EHRs and minimal studies on EHRs' impact on nurses.
Conclusion: Examined the evidence of HIT's positive and negative impacts on clinician's practice, clinicians work environment, and if psychological impact differed among clinicians.

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Nurses use health information technology (HIT) extensively at the point of care. Technology use has had positive and negative consequences on professional practice. Executive leaders and policymakers have encouraged widespread HIT adoption to improve patient safety, quality and reduce costs. Yet, HIT implementation, including electronic health records (EHRs), have resulted in unintended consequences (i.e., clinicians reporting negative effects on work environments).

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To address HIT challenges, the American Academy of Nursing (AAN) expert panels, including quality, informatics, and ethics, convened a policy dialogue in 2018. The policy dialogue resulted in a policy brief calling for an in-depth examination of technologies' impact on clinicians. Particularly concerning was the evidence suggesting that moral distress and burden is present with dissatisfaction of EHRs (e.g., poor design, time spent documenting) (Boyle et al., 2019). The AAN expert panels framed the recommendations in the policy brief into a proposal for a manuscript that examined the evidence of technologies positive and negative impact on clinicians.

This scoping review provides insight into positive and negative consequences of technology deployment on practicing clinicians. The polarity model was used as a guiding framework for this scoping review. Polarities are called paradoxes, dilemmas, or tensions. Johnson (2020) says about polarities: "*No matter what they are called, they are unavoidable because we live in them and they live in us. They are also inherently unsolvable in that you cannot choose one pole of the pair as a 'solution' to the neglect of the other pole and be successful over time.*"

Johnson (2020) indicates that there is a natural tension between two poles of a polarity. Treating one polarity pole, considered as "or" thinking, leads to a vicious cycle of tension with unnecessary dysfunction, pain, and suffering. These unnecessary tensions, such as dissatisfaction with technology, negatively impact a clinician's ability to attain personal goals and impact professional performance. These situations may lead to grave consequences for the profession, including higher burnout and turnover. However, if important issues are addressed through polarity thinking, using "and" instead of "or" thinking, a virtuous cycle develops characterized by goal achievement, higher levels of satisfaction and gratification. According to Wesorick and Shaha (2015), polarity—"and"—thinking is a key component for successful HIT implementation.

Background

The HITECH Era

The Health Information Technology and Economic Clinical Health Act (HITECH) enacted as part of the Accountable Care Act of 2009 ushered in a new era of clinical responsibility and burden related to HIT use (Gold & McLaughlin, 2016). HITECH created legislation designed to improve care delivery in several areas including improving health care quality, safety, and efficiency, as well as application and use of HIT standards for documentation (Gold & McLaughlin, 2016). This sweeping legislation was designed to stimulate HIT adoption enabling patients to obtain the care they need, allow health care providers to provide person centered care, make timely and accurate diagnoses, improve immunization reporting and disease surveillance, and advance precision medicine (ONC, 2016).

In many ways, this legislation has achieved what it set out to do. For example, by 2017, 80% of providers and 96% of hospitals had adopted a federally certified EHR (ONC, 2017). EHR adoption rates in other settings like nursing homes (66%) and home health (78%), which were not eligible for meaningful use incentives, promoted by the legislation, initially lagged behind other sectors, but have made advances in adoption (Henry et al., 2018). However, the effectiveness of EHRs to achieve improved quality, safety, and efficiency has received mixed reviews (Alexander et al., 2020; Clemens, 2021; Trout et al., 2022). As a result of these challenges with EHRs, Congress enacted the 21st Century Cures Act and specifically included requirements for the executive branch to examine and address clinician burden associated with EHR use (Gettinger & Zayas-Cabán, 2021). Further, evidence suggests that rapid change in EHR adoption has created positive and negative impacts on clinicians. For instance, gains in EHR use have created higher levels of clinician stress, burnout, and work-life imbalances that contribute to increased staff turnover rates, and early retirements (Bautista et al., 2020; Kroth et al., 2019; Williams, 2021).

Eustress, Distress, and Moral Distress Caused by HIT

Stress is multidimensional and although the common connotation of "stressful" events is negative, not all stressors are negatively appraised (Lazarus, 1966; Selye, 1974). Like the polarity model, stress exists on a continuum, from positive stress (eustress) to negative stress (distress). Eustress is constructive, positive, and "associated with activation and engagement" (Pluut et al., 2022). Life examples of eustressors are graduation, starting a new job, and retiring. Among the health care workforce, productive and activating stressors can include performing successful procedures or knowing that one's work has improved another's health. HIT, including EHRs, has the potential to cause eustress when it is perceived to have improved quality of care. The degree to which the EHR is perceived as a productive, useful eustressor is not fully known. At the other end of the spectrum is distress, that is stress that has negative effects on one's psychological, physical, or behavioral state (Pluut et al., 2022). EHRs may create distress by diverting a health care professional's attention from patient care, being time-consuming, or when they are perceived as a mechanism for reimbursement only (Hirschtick, 2006). A growing field of study is moral distress, a type of (but not synonymous with) distress. Moral distress occurs when system problems constrain health care professionals from taking what they believe to be ethically appropriate actions or force them to take actions that are ethically inappropriate based on their professional obligations. These constraints result in a sense of complicity in wrongdoing (Epstein et al., 2019, 2020; Hamric, 2014; Jameton, 1993; Varcoe et al., 2012). Causes of moral distress occur at the patient level (e.g., unnecessary suffering), unit level (e.g., poor team

communication), and/or system level (e.g., lack of policy guidance). While EHR-related stressors that generate moral distress are understudied, a recent study showed excessive documentation requirements was the primary cause of moral distress among physicians (Epstein et al., 2019).

Documentation Burden and Usability

Documentation burden is associated with nursing burnout. However, Moy (2021) notes there are no clear definitions of documentation burden. Research on documentation burden among nurses who were members of the American Nurses Association found that 38.7% of participating nurses (n = 2256) reported burnout, with high emotional exhaustion (34.5%) and depersonalization (21.1%) (Dyrbye et al., 2020). Similarly, other research recognized EHR use as a high contributor to burden of documentation and usability (Alexander & Staggers, 2009).

Usability is defined as both a quality attribute including ease of use of an electronic computer interface, but it can also be defined through research methods that assess ease of use during the design process of computer interfaces (Nielsen, 2012). One of the most common sources of usability concern among health care providers is the EHR (Abraham et al., 2021; Alexander & Ballou, 2018; Lilholt et al., 2006; Lowry et al., 2012). In nursing, experts have described significant usability pain points including HIT design, workflow fit, excessive documentation and handoffs, lack of integrated interoperable data systems, and availability of information resources to support care delivery (Staggers et al., 2018). Similar problems have been linked with other types of clinicians (e.g., physicians) and their satisfaction with EHR use (Thomas Craig et al., 2021). Examples include excessive data entry requirements, long cut-and-pasted notes, inaccessibility of information from multiple institutions, notes geared toward billing, interference with work-life balance, and problems with posture and pain attributed to the use of EHRs (Kroth et al., 2019). These problems are across all health care settings and disciplines. For example, management of documentation, time consumption, and access to patient data were some of the most frequent attributes used to assess the impact of EHRs on clinicians working in long-term care settings (Kruse et al., 2017). In summary, the impact of the EHR on clinicians has been reported in the literature but not viewed through Polarity thinking emphasizing negative and positive effects.

Methods and Analysis

Methods

A team representing three expert AAN panels conducted the scoping review. The expert panel members were supported by an experienced Medical Research Librarian trained in Joanna Briggs Institute Scoping Review methods (Peters et al., 2020). A comprehensive review of the literature was completed using six databases with keywords relevant to HIT's positive and negative impacts on clinicians. The scoping review followed the five-stage method by (Arskey & O'Malley, 2005), outlined in Table 1.

Stage 1: Identifying the Research Question
Key issues identified in the 2019 AAN policy dialogue guided this work. The team's statement of purpose was to identify the evidence of HIT's positive and negative impacts on clinicians. Three research questions guided this work:

1. What are the positive and negative impacts of HIT (including but not limited to EHRs) on clinicians' work environment?
2. What are the positive and negative psychological impacts of HIT on clinicians?
3. Are there differences in positive and negative consequences of HIT among different clinicians?

Stage 2: Identifying Relevant Studies: Search Strategy and Information Sources
Databases were chosen and a rigorous literature search was performed as a pilot in PubMed. Twenty-five articles were initially screened by two teams of two experts each. The results of the pilot search were analyzed, and search terms were added or deleted. After which all six databases: PubMed (National Library of Medicine), Academic SearchTM Complete (Ebscohost), Cumulative Index of Nursing and Allied Health Literature: CINAHL Complete (Ovid), Embase (Elsevier), PsychInfo (OVID), and Scopus (Elsevier) were searched with the developed strategy from the initial pilot. Subject Headings were reviewed for additional key search terms in CINAHL Complete, MeSH in PubMed, EMTREE in Embase. Academic Search Complete, Scopus, and PsychInfo to enhance search results. These results were then combined (using Boolean "OR") with the results of all six databases and subject heading searches combined into a Covidence (*Covidence Systematic Review Software, Veritas Health Innovation, Melbourne Australia*, 2021 (Covidence Systematic Review Software, 2021)) database. Covidence is an online systematic review management tool that can automatically deduplicate the search results as they are imported into the software. Final searches in all databases were run February 2021. The final search strategy is available in supplement materials.

Terms were cross-referenced across vocabularies of all databases to locate articles more accurately from multiple databases. For example, translation from Emtree terms to MeSH terms for MEDLINE in Ovid often identifies new terms that were added to the search strategy before the translation to other

Table 1 – Five Stage Approach

Description of Methods Using Arskey and O'Malley (2005) Five Stage Framework

Phase	Description	Approach
Stage I	Identify the research question	American Academy of Nursing (AAN) expert panels framed the research question, proposed to AAN Board the need for consensus on the research questions relevant to AAN policy priorities. Board Approval received. Scoping review to support consensus launched.
Stage II	Identify relevant studies	Medical reference librarian added to the research team. Protocol developed for the scoping review with clarification of the research question and subcomponents. Databases selected, five research articles provided to the librarian to begin the search development. Indexing strategy was initially developed from the five articles and then was broadened using PubMed's MeSH subject headings. Appropriate text/key words were also identified. Inclusion and exclusion criteria were decided upon. Pilot test run with 25 articles and search criteria refined. Results imported into Covidence for review and analysis.
Stage III	Study selection	All results were imported into Covidence, which deduped automatically. The researchers worked in teams of two to screen by abstract/title and full-text and final results were divided individually amongst faculty for data extraction. Data extraction and quality assessment performed with criteria established to exclude, include or retain for background.
Stage IV	Chart the data	Two initial researchers performed initial synthesizing and interpreting qualitative data by sifting, charting and sorting material according to key issues and themes.
Stage V	Collate, summarize, and report results	Final stage of analysis to be performed with the entire research team on 101 final articles included. Collecting and reviewing studies for a full systematic. The researchers read and extracted and reviewed for relevance and quality 101 articles and analyze thematically for the final report.

databases. A new term identified with this method was the term "technostress." A separate spreadsheet was maintained by the librarian throughout the process to capture data, as well as search strategies for the individual databases, for ease of reproducibility. Lists of search terms were iteratively reviewed by the team after compilation and review of articles for each database.

Stage 3: Study Selection

Once the search was complete, all publications were screened by reviewing the title and abstract in Covidence. Inclusion and exclusion criteria were established by a group of four researchers. Then two teams of two researchers reviewed half of the titles and abstracts. Any disagreement was discussed in the full group. Articles that passed the screening review were then moved to full-text review. Table 2 includes the screening criteria.

Stage 4: Charting the Data

The charting process constitutes the data extraction and collection process. The reviewers identified a list of data points based on screening criteria to create an extraction template in Covidence. During the iterative process, regular random data checks between two or more team members' extractions found high levels of congruence. The data extracted included: title, first author, year, citation, aims/objectives, country, research/nonresearch, study design, Institutional Review Board (IRB) approved, study population, whether an intervention was included, sample size, methods, instruments, results, key concepts, and limitations. Once extraction was completed, the results were exported into an Excel Comma Separated Values (CSV) file, then imported into Dedoose (version 8.0.42;

Table 2 – Inclusion–Exclusion Search Terms Criteria

Inclusion Criteria	Exclusion Criteria
Electronic health record	Decision Aid
Electronic medical record	Randomized Control Trial
HER	RCT
EMR	
Technology	
Moral distress	
Technostress	
Stress	
Burnout	
Documentation	
Satisfaction	
Benefit	
Depression	

Note. Inclusion and exclusion criteria to inform selection for scoping review.

Table 3 – Summary of Review

	Characteristic	Frequency (n = 101)	
		%	n
Publication year			
	2009–2013	18.8	19
	2014–2018	45.5	46
	2019–2021	35.6	36
Country			
	USA	80.2	81
	Canada	3.9	4
	Finland	3.9	4
	Unknown or multinational	2.0	2
	Taiwan	2.0	2
	Australia	2.0	2
	Germany	2.0	2
	Switzerland, South Africa, Colombia, Brazil	1.0	1 each
Methods			
	Quantitative: Cross-sectional survey	47.5	48
	Quantitative: Case study	2.0	2
	Quantitative: Instrument development	2.0	2
	Quantitative: Intervention	12.9	13
	Quantitative: Retrospective or medical record review	8.9	9
	Qualitative	14.8	15
	Mixed methods	5.9	6
	Systematic/scoping review	4.9	5
Instrument*			
	Health information technology: technical (time, skill, usability)	25	26
	Health information technology: psychological (stress, satisfaction, burnout)	10.6	11
	Work environment (administrative time, workload, professionalism, culture, error)	15.4	16
	Work-life balance	2.9	3
	Job satisfaction	12.5	13
	Psychological factor: Burnout	13.5	14
	Psychological factor: stress/distress	6.7	7
	Psychological factor: well-being	1.9	2
	Patient care (patient satisfaction, quality of care)	1.9	2
Sample*			
	Physicians	59.6	62
	Nurses	16.3	17
	Advanced practice providers	10.6	11
	Interprofessional or unspecified providers	6.7	7
	Patients	3.8	4
	Health care organizations	59.6	62
	Educators	0.96	1
	Managers	0.96	1
	Informaticists	0.96	1
	Other	1.9	2
Setting			
	Primary care	21.2	23
	Inpatient (acute, intensive care)	15.4	25
	Both	3.8	4
	Members of national or regional organization	14.4	15
	Unspecified other	35.6	37

* Instrument and sample total greater than 101 due to multiple instruments used or more than one provider type in single study.

Socio-Cultural Research Consultants, LLC; Los Angeles, CA) for further analysis of results.

Stage 5: Data Summary and Synthesis of Results

The final phase of the process is the analysis of the results. The Dedoose tool was used. This is a web-based qualitative analysis platform that facilitates access by multiple researchers. The extracted data were analyzed thematically, assigned categories and subcodes, and annotated using a constant comparison method with two researchers to generate themes (Table 3).

Table 4 – Technologies Positive and Negative Work and Psychological Impact

Technologies Positive and Negative Work and Psychological Impact			
Negative Downside of Technology		Positive Upside of Technology	
Work Negative Impact		Work Positive Impact	
Cognitive workload	4	Accuracy	5
Communication	2	Burden	4
Inefficiency	6	Efficiency	18
Quality of care	1	Error	1
Safety	1	Quality of Care	6
Psychological Negative Impact		Psychological Positive Impact	
Burnout	28	Burnout	4
Satisfaction	20	Satisfaction	22
Stress	20		
Totals	82		60

Findings

Study Characteristics

The initial electronic search yielded 2,155 citations. Upon review of abstracts, 1,431 were excluded from full review with one article not retrievable. The team reviewed 448 full-text articles and selected 101 for final inclusion, including 93 research articles, five systematic reviews, and three quality improvement (QI) initiatives (See PRISMA diagram). Studies of HIT and work environment or psychological status increased over time. More than half of the articles included were published between 2018 and 2021. Of the 96 research and QI studies, the majority (78) were conducted in the United States. Table 4 reflects a synthesis of the scoping review and technologies positive and negative work and psychological impact. The categories reflected in this table are not mutually exclusive with some studies indicating both a positive and negative work or psychological impact in multiple categories. The summary reflects that 82 of the studies reviewed were indicating either a negative psychological or work impact. Whereas 60 of the studies reflected a positive psychological or work impact. Of the positive categories many of the studies were interventional studies focused on improving technologies impact on outcomes such as satisfaction, burnout or stress. The following will reflect details on how the themes within the table were reflected in the scoping review literature.

EHR and Psychological Factors

Relationships between EHRs and burnout were evaluated in 27 studies. Twenty-three of these identified negative associations, three identified positive associations, and one was mixed. Excessive documentation requirements (Beck et al., 2020; Gardner et al., 2019; Kroth et al., 2018), high in-box volumes (Gregory et al., 2017; Hilliard et al., 2020; Rassolian et al., 2017; Sutton et al., 2019; Tai-Seale et al., 2019), and having insufficient time for documentation (Gardner et al., 2019; Harris et al., 2018; Linzer et al., 2020; Rassolian et al., 2017) were most commonly associated with burnout. However, some aspects of HIT are perceived positively. For example, Hysong et al. (2014) found that among 2,590 primary care providers at 131 Veteran's Affairs (VA) hospitals, the perceived value of electronic alert systems was significantly associated with decreased turnover and provider satisfaction. Linzer et al. (2016) reported of 579 clinicians sampled, 67% had high stress and 38% were experiencing burned out (burnout range 10%–56% by division) including low work control, high documentation time pressure, too much home EHR time, and chaotic workplaces. Hennington et al. (2011) found an indirect link to lower burnout (specifically emotional exhaustion) among providers who felt that HIT was compatible with their values and beliefs; these providers also tended to have a lower likelihood of role conflict. In turn, less role conflict was associated with lower levels of emotional exhaustion.

Positive relationships between EHRs and satisfaction were found in 19 studies. It makes logical sense that HIT systems perceived as having better usability would be correlated with greater satisfaction among health care providers and this was found to be true in two studies (Hudson et al., 2018; Wright & Marvel, 2012). Usability may include such things as alignment with workflow, ability for customizing, or data capture that consists mainly of discrete fields rather than narrative (Hersey et al., 2019). Similarly, familiarity and frequency of use are also associated with higher satisfaction levels. In two studies (Ghahramani et al., 2009; Wylie et al., 2014) younger physicians (residents and interns) tended to be more satisfied than older physicians with the EHR. When it comes to the impact of EHR on overall job satisfaction, several studies found associations. One study (Menachemi et al., 2009) identified that providers who were satisfied with the EHR were four times more likely to be satisfied with their practice than those who were not satisfied with EHR. Dissatisfaction with the EHR was also associated with low professional and work-life balance (Babbott et al., 2014; Coleman et al., 2015; Friedberg et al., 2014; Malhotra et al., 2018).

Relationships between the EHR and stress tended to be negative. Documentation time pressure was found to be connected to increased stress among physicians. In a study by Linzer et al. (2020), female physicians had 61% lower odds of having a manageable workplace and manageable EHR stress. In a longitudinal study in Finland, increased stress related to HIT over time (Heponiemi et al., 2017). Heponiemi et al. (2017) found that the increase was especially true among primary care providers and among those in leadership positions.

EHR and Work Environment Factors

The EHR and its relationship to work-related factors such as cognitive workload, time pressure, inefficiency, and communication were common areas of study. Higher levels of perceived cognitive/workload were associated with higher levels of stress-related to HIT use among physicians in Finland (Heponiemi et al., 2018) and EHR use among health care providers in Colombia (Sandoval-Reyes et al., 2019). Additionally, desensitization to repeated best-practice advisories was identified by Ancker et al. (2017). EHR information overload and workflow inconsistencies were associated with misses and near-misses among physicians (Ratanawongsa et al., 2018). Several studies identified associations between the EHR and inefficiency, despite the intention of technology to improve efficiency. In fact, Lilly et al. (2019) found that implementation of the EHR increased the number of tasks to be completed by clinicians. Further, Lalley (2014) found that, among nurses, the EHR generated obstacles necessitating nurse workarounds, which detracted from time with patients. Risk factors for EHR order entry and communication errors included EHR usability, where computers were located, and progress note content (Ratanawongsa et al., 2018). Multiple studies identified remote EHR work as convenient but burdensome (Arndt et al., 2017; Peccoralo et al., 2021; Robertson et al., 2017), although several studies also identified increased efficiency with regard to EHR use at home (Abdrbo et al., 2009; McCormick et al., 2018; Taylor et al., 2019).

EHR Intervention Studies

Of the 13 intervention studies, five used medical scribes (Imdieke & Martel, 2017; McCormick et al., 2018; Mishra et al., 2018; Platt & Altman, 2019; Taylor et al., 2019); one used clerical support (Contratto et al., 2017), three used EHR training (Dastagir et al., 2012; Robinson & Kersey, 2018; Stonham et al., 2012), one used clinical decision support (Hoelscher & McBride, 2020), and two used data entry efficiency tools (Carlson et al., 2015; Hsieh et al., 2016). Medical scribe interventions were largely successful in reducing physician documentation time or burden, and/or after-hours documentation time (Boyle et al., 2019; Mishra et al., 2018; Platt & Altman, 2019), in some studies by as much as 50% (Imdieke & Martel, 2017). However, results are mixed with lower (Taylor et al., 2019), no changes (McCormick et al., 2018) and higher (Platt & Altman, 2019) patient satisfaction with use of scribes.

EHR training interventions were successful in terms of increasing documentation accuracy, improved efficiency, documentation confidence, and/or use of established order sets (Dastagir et al., 2012; Robinson & Kersey, 2018) although all these studies relied mainly on self-report rather than objective EHR data. A study to support clinical decision making using an EHR tool improved provider satisfaction although measures of clinical improvement were unchanged (Hoelscher & McBride, 2020). Tools to improve documentation efficiency were successful. Hsieh et al. (2016) implemented evidence-based focus templates for medical-surgical nurses and found that documentation time was reduced by 60% from 138.5 hr/7 days to 55.8 hr/7 days. Likewise, introduction of structured data-entry forms improved physician satisfaction, decreased stress, and decreased documentation time in one primary care setting (Carlson et al., 2015).

EHR and Nursing Studies

Nurses may be especially sensitive to organizational factors that influence work routines, including the EHR. For example, Tawfik et al. (2020) evaluated burnout in neonatal intensive care settings (NICU) and found that higher levels of burnout were associated with busy NICUs and those with EHRs. Further, stronger associations with organizational factors (e.g., daily admissions, nursing hours/patient) were found among nurses than physicians. In a qualitative study (Lalley, 2014), the influence of organizational factors involving EHRs on nursing practice was evident. This study explored medical-surgical nurses' encounters with technology obstacles, one of which was the bar code medication administration (BCMA) technology and their workarounds. One respondent noted that the BCMA asks the nurse to respond yes or no to confirm that 176 medication dosages remained in the BCMA prior to retrieving the medication for administration. The common workaround was to answer "yes" without counting the remaining doses. Lalley (2014) noted that "this behavior had become a unit norm."

Most studies identified for this scoping review focused on EHR interactions. In a study of Ohio Nurses Association members, information systems were primarily perceived as helpful, easy to use and contributed to quality of care and improved communication (Abdrbo et al., 2009). Other studies identified aspects of EHR interactions that were burdensome or stressful. For example, nurses for whom EHR was less compatible with their values (e.g., about how to conduct work or the role of computers) were more likely to experience role conflict (Hennington et al., 2011). Time

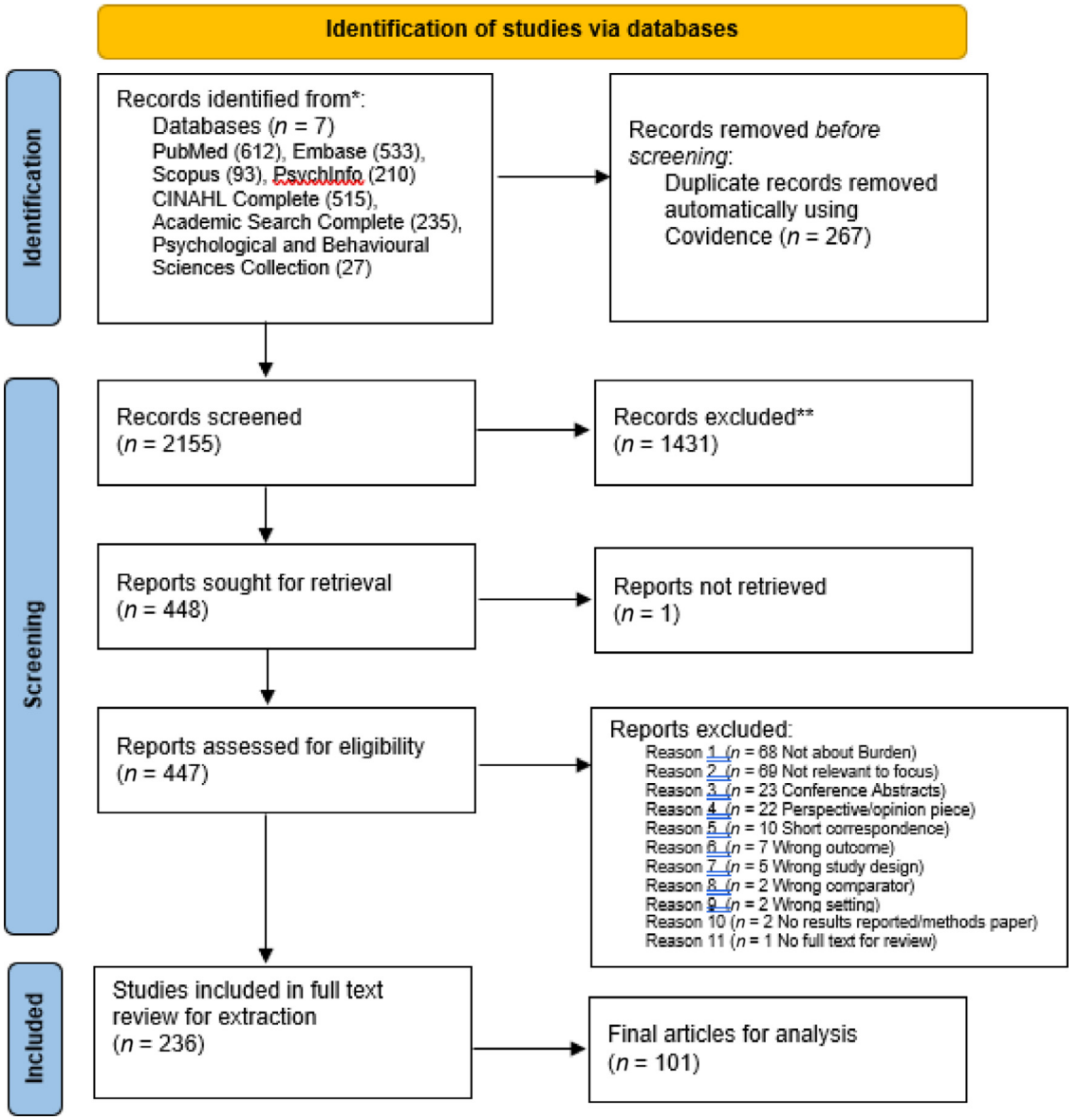

Figure 1 – PRIMSA diagram.

pressures related to work (pressure from unfinished work and having too little time to do work) were associated with lower perceptions of user-friendliness and EHR reliability among more than 3,600 Finnish nurses (Vehko et al., 2019). However, McBride et al. (2017) found that nurses who had more HIT knowledge and were confident had higher levels of satisfaction with their EHR systems, suggesting that interventions to improve familiarity and adeptness may improve nurse satisfaction. Two intervention studies successfully used focused documentation strategies to improve documentation time and satisfaction (Hsieh et al., 2016; McIlreevy et al., 2021). Hsieh's (2016) study used focused documentation and reduced documentation time by 82 hr/week. McIlreevy et al. (2021) used a revised, logical Adult Admission History Form and documented reduced time-to-complete and fewer unused fields (Figure 1).

Discussion

Few studies relate technology's impact on nurses, including the EHR, medication administration technology and various technologies for patient monitoring, QI tracking, supply management, and team communication. The findings of this scoping review are predominantly survey-based studies related to satisfaction and burnout in physicians. Emerging evidence supports that burden of documentation negatively impacts nurses, but not as severely as physicians. Clear evidence correlating or establishing relationships to technology and distress, particularly moral distress, is limited, and no studies explicitly examined moral distress related to technology's impact.

Intervention studies identified in the review suggest that the downside of technology can become positive

with intervention. Overall, targeted interventions to reduce documentation time and burden have potential for improving the stress, dissatisfaction, and possibly burnout experienced by physicians, nurses, and other health care professionals. More objective measures of the outcomes of the interventions are needed. Additionally, research focused on workload and the impact on clinicians' psychological well-being is recommended.

Federal policy regulatory requirements for quality reporting are associated with work burden to collect the data, and clinician dissatisfaction. However, we did not find evidence of studies about the association between burden and quality reporting or data collection for quality measures. These challenges for clinicians should be further investigated for ways to streamline quality reporting and the associated documentation required (Moy et al., 2021). With continuous increases in regulations for reporting quality measures, consultation with clinicians and other stakeholders involved in capturing the required information is critical to avoid an increase in work burden.

The real and raw experience of "living in the downside of technology" mandates that leaders "course correct" and take bold action steps to ensure there is an intense focus on both the negative and positive values of technology while safeguarding the quality of clinical practice. Examining technology from a model of polarity thinking where positives and negatives naturally exist aligns with the concepts of eustress and distress with the idea that not all stressors are negative. One example of distress created with EHRs and technology is capturing regulatory requirements for quality. While this is seen as a stressor resulting in negative aspects of technology, one can argue that quality reporting requirements are necessary to continue to address quality, safety, and population health. Visualizing this requirement using a polarity lens would have us hold the positive concept/need for quality reporting and address the downside by streamlining quality measures reporting across settings.

Limitations to this scoping review are noteworthy. It is possible that we have missed studies. There were large volumes of articles retrieved and reviewed over a 2-year period; while we attempted to go back and review additional publications, it is possible the research team missed potentially important publications.

Conclusion

In conclusion, this scoping review examined the evidence of HIT's positive and negative impacts on clinician's practice, clinicians work environment, and if psychological impact differed among clinicians through a polarity lens. The review resulted in 101 articles for final inclusion, including 93 research articles, five systematic reviews, and three QI initiatives. Unfortunately, many of the studies found in this review are not high quality. Furthermore, only one study included a longitudinal design. Stronger research designs are needed. The review indicates a lack of evidence to understand relationships between moral distress and the use of the EHR. The EHR and other technologies clearly impact clinicians' efficiency and workflow. Further, the review shows that there are no studies examining the burden for collecting electronic quality measures and related documentation required to meet these regulations. This scoping review indicates that technology-related stressors that may generate moral distress have not been studied. Further, as policy changes are recommended to reduce the burden of documentation in EHRs due to regulatory quality reporting, we need to ensure that unintended consequences do not occur with these changes. The reduction of documentation can impact the ability to assess population health, quality, and safety if we fail to capture critical information within the EHR.

Author Contributions

Susan McBride: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Data curation, Writing - original draft, review, and editing, Visualization, Project administration. Gregory L Alexander: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Data curation, Writing - draft, review, and editing, Visualization. Marianne Baernholdt: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Data curation, Writing - draft, review, and editing, Visualization. Beth Epstein: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Data curation, Writing - draft, review, and editing, Visualization. Margaret Vugrin: Methodology, Validation, Advising Formal analysis, Investigation, Data curation, Writing - author and editing methods section.

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Supplementary Materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.outlook.2023.101918.

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