

Review

UNDERSTANDING THE IMPACT OF TECHNOSTRESS ON NURSES' WELL-BEING AND PROFESSIONAL FUNCTIONING: A SCOPING REVIEW

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Key Messages:

1. Technostress negatively affects nurses' well-being and professional functioning.
2. Digital competence and organizational support reduce the impact of technostress.
3. Targeted training and supportive leadership can help mitigate technostress.

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Abstract

Background: Rapid digitalization has transformed nursing practice, introducing new technological demands that generate technostress. Although technostress has been widely studied in organizational contexts, its specific impact on nurses' psychological well-being and professional functioning remains underexplored.

Aim: This scoping review aimed to examine the evidence regarding the effects of technostress on nurses' well-being and professional outcomes.

Materials and Methods: A scoping review was conducted following the PRISMA-ScR guidelines. Electronic databases (CINAHL, MEDLINE, PubMed, JSTOR, Scopus, and IEEE) were searched for studies published between January 2016 and February 2026. After the removal of duplicates and screening for eligibility and relevance according to the PCC framework, 11 studies were included.

Results and Conclusion: The included studies were published between 2024 and 2025. The findings were synthesized into four main themes: (1) technostress and psychological well-being; (2) technostress and professional functioning; (3) Mediating mechanisms linking nurses and technostress; and (4) organizational and individual factors influencing the effects of technostress. Technostress was consistently associated with burnout, emotional exhaustion, and reduced well-being. It also negatively affected work performance, job satisfaction, and work engagement. Emotional intelligence, enhanced digital competencies, employer support, and effective system implementation were identified as factors that mitigate these effects.

Key words: *digital technology; work stress; nursing; informatics*

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Introduction

The healthcare delivery system upholds the fundamental principles of person-centered care, including safety, effectiveness, efficiency, and accessibility. These strengths stem from rapid technological progress, growing expectations for sustainable services, and workforce challenges such as staff shortages, turnover, migration, and the potential impacts of geopolitical instability.^{1,2} Because caring lies at the heart of nursing, the increasing integration of technology—used to collect data and enhance patient safety—marks a significant development in nursing practice. As technological tools continue to evolve, their primary purpose remains clear: to improve patient outcomes. Nevertheless, despite these technological advancements, caring for the patient remains the fundamental element of nursing practice.^{3–5} Consequently, the introduction of new technologies into nursing practice requires nurses to develop additional competencies to deliver care effectively.^{6,7} In many countries, competency frameworks have been strengthened to establish minimum standards of knowledge, skills, and professional attitudes required for healthcare practice.² Digital competencies refer to the knowledge, skills, and abilities that enable nurses to perform their duties effectively and safely while exercising appropriate clinical judgment without direct supervision.^{8–10} Nurses must possess these competencies to provide safe and efficient patient care. However, as expectations for digital proficiency continue to increase, so do the demands placed on nurses.^{4,11}

Nurses often experience frustration when interacting with new technologies.¹² This frustration may arise from a variety of factors, including poor system usability, insufficient knowledge or training, and situations in which technological tools add to an already demanding workload. The rapid adoption of new systems, frequent software updates, and the need to adapt continuously to evolving digital tools can create considerable pressure. This has drawn increasing attention to the concept of technological stress among nurses, an emerging challenge that

occurs when the demands associated with technology exceed an individual's capacity, resources, or available support to manage them effectively.^{13, 14} Technological stress, commonly referred to as *technostress*, is a specific form of stress that arises from an individual's interaction with and use of digital technologies.¹⁵ Technostress was first described in 1984 by Brod as a modern maladaptive condition resulting from an individual's inability to adapt to or cope effectively with new computer technologies. It refers to the psychological and physical discomfort experienced when individuals are exposed to or required to use new technologies.¹⁶ According to the transactional model of stress, technology shapes the work environment by introducing specific demands and conditions. Individuals appraise these technological demands, and when they perceive them as excessive or beyond their coping capacity, these demands become technostressors.^{17,18} Nastjuk et al.¹⁹ identified five primary creators of technostress: **techno-complexity**, characterized by technology that feels overly complicated („too difficult”); **techno-invasion**, reflecting a sense of constant connectivity („always connected”); **techno-insecurity**, involving fears of being replaced or becoming obsolete („being replaced”); **techno-overload**, in which technology increases workload and work pace („too much”); and **techno-uncertainty**, arising from frequent updates and continual technological changes („too many changes”). In addition, prolonged exposure to digital devices and online environments may lead to digital burnout, thereby diminishing the potential benefits of digital technologies.²⁰ These factors can substantially affect nurses' workplace well-being, which reflects the overall quality of employees' experiences in the workplace. Workplace well-being is a multidimensional construct²¹ manifested through both positive and negative indicators.²² Positive indicators include happiness and self-acceptance,²³ whereas negative indicators include burnout, insomnia, psychological stress, and depression. Furthermore, these negative outcomes may contribute to employees' intention to leave their jobs.²⁴

Within the nursing context, professional functioning refers to nurses' ability to perform their professional roles effectively, maintain work engagement, and achieve clinical effectiveness.^{25, 26} Furthermore, higher levels of workplace well-being enhance professional functioning by improving job performance, strengthening resilience, and reducing burnout.²⁶

Although technostress has been widely examined in organizational and information systems research, relatively little attention has been paid to its specific impact within the nursing context. In particular, insufficient emphasis has been placed on understanding how technostress influences nurses' psychological well-being and professional functioning. Given the central role nurses play in patient care and the increasing reliance on digital technologies in clinical environments, this gap in the literature is noteworthy. Therefore, a more focused exploration of the effects of technostress on nurses' health, professional performance, and the quality of patient care is warranted.

Aim

The aim of this scoping review was to map and synthesize the available evidence on the impact of technostress on nurses' well-being and professional functioning. The review addressed the following research question: What evidence is available regarding the impact of technostress on nurses' well-being and professional functioning?

Materials and Methods

Study design and reporting

A scoping review was conducted to map the available evidence regarding the impact of technostress on nurses' well-being and professional functioning. The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guideline.²⁷ Studies published between 1 January 2016 and 25 February 2026 were considered eligible for inclusion.

Protocol and registration

The review protocol was not prospectively registered. The review was conducted according to a predefined methodology based on the PRISMA-ScR reporting guideline to ensure methodological transparency and consistency throughout the review process.

Search methods and screening for studies

A comprehensive literature search was conducted in the electronic databases CINAHL, MEDLINE, PubMed, JSTOR, Scopus, and IEEE to identify studies examining technostress among nurses. The search strategy was developed using the Population–Concept–Context (PCC) framework recommended for scoping reviews, in which the population comprised nurses, the concept was technostress, and the context included health-care settings. Controlled vocabulary (e.g., MeSH terms, where applicable) and free-text keywords were combined using Boolean operators (AND, OR). The search strategy was adapted to the indexing requirements of each database. The database search was performed on 25 February 2026.

The search was limited to studies published between 1 January 2016 and 25 February 2026 to capture evidence reflecting contemporary digital healthcare environments. Over the past decade, the rapid implementation of electronic health records, hospital information systems, mobile health technologies, and, more recently, artificial intelligence has substantially transformed nurses' use of digital technologies. Consequently, studies published before 2016 were considered less representative of current clinical practice and the contemporary technological landscape.

Relevant articles were downloaded and organized using the reference management tool Zotero. To identify additional potentially relevant studies, a manual search was conducted by reviewing the reference lists of the included articles. The review was limited to studies published in English. The search strategy included synonyms and related terms describing nurses (e.g., nurse, nursing staff, registered nurse), technostress (e.g., technostress, techno-stress, technology-related

stress, digital stress, ICT stress), and outcomes related to nurses' well-being and professional functioning (e.g., burnout, emotional exhaustion, work engagement, job satisfaction, work performance, psychological well-being).

The search syntax was adapted to the specific requirements of each database while maintaining the same conceptual structure (Table 1). Database-specific filters were applied, where available, to restrict results to English-language

publications within the predefined time period. No additional restrictions regarding study design were applied.

To minimize the risk of duplicate data, the included studies were examined for potential overlap in study populations by comparing authors, study settings, recruitment periods, and sample characteristics. No evidence of substantial overlap among the included study populations was identified.

Table 1: Search strategy used in selected databases

Database	Complete search strategy	Filters	Date searched
PubMed	((“Nurses” OR “nurse*” OR “nursing staff” OR “registered nurse*” OR „clinical nurse*”) AND (“technostress” OR “techno-stress” OR “technology-related stress” OR “digital stress” OR “ICT stress” OR “technology burden” OR “technology overload” OR “technology complexity”) AND (“burnout” OR “emotional exhaustion” OR “psychological well-being” OR “wellbeing” OR “mental health” OR “job satisfaction” OR “work engagement” OR “work performance” OR “professional functioning”))	- English language 01/01/2016-25/02/2026	25/02/2026
Medline	((“Nurses” OR “nurse*” OR “nursing staff” OR “registered nurse*” OR „clinical nurse*”) AND (“technostress” OR “techno-stress” OR “technology-related stress” OR “digital stress” OR “ICT stress” OR “technology burden” OR “technology overload” OR “technology complexity”) AND (“burnout” OR “emotional exhaustion” OR “psychological well-being” OR “wellbeing” OR “mental health” OR “job satisfaction” OR “work engagement” OR “work performance” OR “professional functioning”))	- English language 2016-2026	25/02/2026
Cinahl	((“Nurses” OR “nurse*” OR “nursing staff” OR “registered nurse*” OR „clinical nurse*”) AND (“technostress” OR “techno-stress” OR “technology-related stress” OR “digital stress” OR “ICT stress” OR “technology burden” OR “technology overload” OR “technology complexity”) AND (“burnout” OR “emotional exhaustion” OR “psychological well-being” OR “wellbeing” OR “mental health” OR “job satisfaction” OR “work engagement” OR “work performance” OR “professional functioning”))	- English language 2016-2026	25/02/2026

Database	Complete search strategy	Filters	Date searched
Scopus	((“Nurses” OR “nurse*” OR “nursing staff” OR “registered nurse*” OR „clinical nurse*”) AND (“technostress” OR “techno-stress” OR “technology-related stress” OR “digital stress” OR “ICT stress” OR “technology burden” OR “technology overload” OR “technology complexity”) AND (“burnout” OR “emotional exhaustion” OR “psychological well-being” OR “wellbeing” OR “mental health” OR “job satisfaction” OR “work engagement” OR “work performance” OR “professional functioning”))	- English language 2016-2026	25/02/2026
JSTOR	((“Nurses” OR “nurse*” OR “nursing staff” OR “registered nurse*” OR „clinical nurse*”) AND (“technostress” OR “techno-stress” OR “technology-related stress” OR “digital stress” OR “ICT stress” OR “technology burden” OR “technology overload” OR “technology complexity”) AND (“burnout” OR “emotional exhaustion” OR “psychological well-being” OR “wellbeing” OR “mental health” OR “job satisfaction” OR “work engagement” OR “work performance” OR “professional functioning”))	- English language 2016-2026	25/02/2026
IEEE	((“Nurses” OR “nurse*” OR “nursing staff” OR “registered nurse*” OR „clinical nurse*”) AND (“technostress” OR “techno-stress” OR “technology-related stress” OR “digital stress” OR “ICT stress” OR “technology burden” OR “technology overload” OR “technology complexity”) AND (“burnout” OR “emotional exhaustion” OR “psychological well-being” OR “wellbeing” OR “mental health” OR “job satisfaction” OR “work engagement” OR “work performance” OR “professional functioning”))	- English language 2016-2026	25/02/2026

Eligibility criteria

Eligibility criteria were developed according to the Population–Concept–Context (PCC) framework. The population comprised registered nurses and nursing staff working in healthcare settings. The concept of interest was technostress associated with the use of digital technologies in clinical practice. The context included all healthcare settings in which nurses used digital technologies as part of patient care or professional practice. Both quantitative and qualitative stud-

ies were considered eligible for inclusion. Studies were eligible for inclusion if they: (1) investigated registered nurses or nursing staff working in healthcare settings; (2) examined technostress or technology-related stress associated with digital technologies; (3) reported outcomes related to nurses’ psychological well-being and/or professional functioning; (4) were published in English between 1 January 2016 and 1 February 2026; and (5) were available as full-text articles. Editorials, conference abstracts, letters to the editor, and case reports were excluded.

Study selection and data extraction

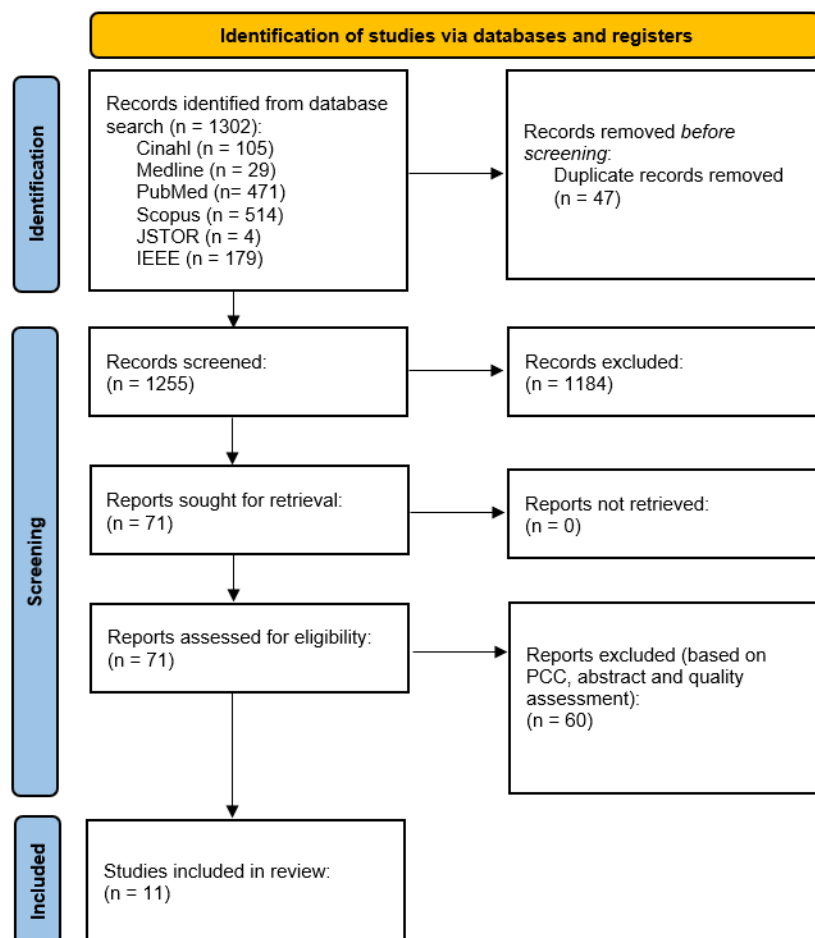
The identified studies were imported into Zotero (version 7.0.30 for Windows), where duplicate records ($n = 47$) were identified and removed. Following duplicate removal, the remaining studies were screened for eligibility according to the predefined inclusion criteria. Studies meeting the eligibility criteria based on the Population–Concept–Context (PCC) framework were included. Two reviewers independently screened the titles and abstracts of all retrieved records, followed by a full-text assessment of potentially relevant studies. Any disagreements regarding study eligibility were resolved through discussion until consensus was reached.

Data from the included studies were extracted using a standardized data extraction form de-

veloped in Microsoft Word. The extracted information included the first author, year of publication, country, study design, study aim, sample characteristics, and main findings relevant to the review question. Consistent with the objectives of a scoping review, no formal critical appraisal or risk-of-bias assessment was undertaken.

Data synthesis was performed using a descriptive thematic synthesis approach. The extracted findings from the included studies were compared to identify common patterns and concepts. Similar findings were subsequently grouped into broader thematic categories reflecting the main areas addressed in the included studies. This process aimed to organize and summarize the available evidence.

Figure 1: PRISMA flow diagram of the selection process of the included studies



Results

Using the predefined search strategy, a total of 1,302 scholarly articles were identified across the selected electronic databases. The search included studies published between 1 January 2016 and 1 February 2026 and incorporated the specified keywords. After removing 47 duplicate records, 1,255 articles remained for screening. Based on title and abstract screening, 1,184 articles were excluded. The remaining 71 articles were retrieved for full-text assessment against the eligibility criteria. Following assessment of PCC relevance and eligibility criteria, eleven studies met the inclusion criteria and were included in the final review.

The characteristics of the included studies are summarized in Table 2, which presents the au-

thors, year of publication, country of origin, study aim, sample characteristics, main findings, and level of evidence according to Polit and Beck.²⁸ The findings of the included studies were synthesized using a descriptive thematic synthesis approach. Similar findings across studies were grouped into broader thematic categories to facilitate the presentation and interpretation of the evidence.

Four main themes emerged: (1) technostress and psychological well-being; (2) technostress and professional functioning; (3) mediating mechanisms linking nurses and technostress; and (4) organizational and individual factors influencing the effects of technostress (Table 3).

Table 2: Characteristics of included studies

Author, year, country	Study design & participants	Technostress assessment	Outcomes assessment	Statistical analysis	Key findings	Hierarchy of evidence by Pollit & Beck
Lara-Aranda et al (2025), Spain	Multicentre, observational, descriptive cross-sectional study; 127 nursing staff working in Intensive Care Units in 3 hospitals in Madrid.	Technostress Questionnaire; assessed anxiety, fatigue, scepticism, inefficacy and techno-addiction related to the use of information and communication technologies.	Sociodemographic and occupational characteristics; technostress dimensions and techno-addiction.	Descriptive statistics; median and interquartile range for quantitative variables; absolute and relative frequencies for categorical variables; Chi-square test, Mann-Whitney U test and Kruskal-Wallis test for bivariate analysis.	A total of 20.47% of participants met the criteria for technostress and 37.79% showed signs of techno-addiction. Gender differences were found in the affective dimension, while age influenced both technostress and techno-addiction. Work experience, shift schedule, contract type and working hours were not significantly associated with technostress. Prior training was associated with reduced fatigue.	Level 6
Atalla et al (2025), Egypt	Descriptive cross-sectional study; 400 nurses employed in a general hospital in Egypt.	Technostress Creators Inventory; assessed dimensions such as techno-overload, techno-invasion, techno-complexity, techno-insecurity and techno-uncertainty.	Information and Communication Technology Demands Scale; Emotional Labor in Nursing Scale.	Descriptive statistics; linear regression; correlation analysis; structural equation modelling to examine direct and indirect relationships between ICT demands, technostress and emotional labor.	The results show that nurses experience high degrees of technostress, emotional labor, and moderate ICT demands. Nurses reported high levels of technostress and emotional labor, and moderate ICT demands. ICT demands were positively associated with technostress and emotional labor. Technostress partially mediated the relationship between ICT demands and emotional labor; suggesting that digital demands may increase nurses' emotional strain through technostress.	Level 6

Baek et al (2025), South Korea	Descriptive cross-sectional study; 188 clinical nurses from three tertiary hospitals in Daegu, South Korea.	Technostress Scale assessing techno-overload, techno-invasion, techno-complexity, techno-insecurity and techno-uncertainty.	Nursing Informatics Competency Scale, Knowledge-Sharing Behaviour Scale and Nursing Work Performance Scale.	Descriptive statistics, independent t-test, one-way ANOVA, Pearson's correlation analysis and stepwise multiple regression analysis.	Nursing informatics competency and technostress were significant predictors of nursing work performance. Among the technostress dimensions, techno-complexity and techno-overload negatively affected work performance, whereas higher nursing informatics competency and knowledge-sharing behaviour improved professional performance.	Level 6
Golz et al (2024), Switzerland	Descriptive cross-sectional study; 154 nurses (145 registered nurses and 9 nursing aides) working in acute care hospitals in Switzerland.	Technostress questionnaire based on the Ragu-Nathan model, including 12 technostress dimensions (e.g., uncertainty, invasion of complexity, invasion of private life), together with measures of digital competence and technostress inhibitors.	Global Job Satisfaction Scale, Digital Competence Scale and technostress inhibitor scales (technical support provision, literacy facilitation and involvement facilitation).	Descriptive statistics, Welch's ANOVA with Games-Howell post hoc test and multiple linear regression with robust standard errors.	Nurses reported moderate levels of technostress, with uncertainty being the most prominent dimension. Greater invasion of private life, unreliability and interruptions were associated with lower job satisfaction, whereas digital competence and literacy facilitation positively influenced job satisfaction.	Level 6
Kopuz et al (2025), Turkey	Descriptive cross-sectional study; 330 nurses working in a public hospital in Turkey.	Technostress Creators Scale assessing techno-overload, techno-invasion, techno-complexity, techno-insecurity and techno-uncertainty. Technostress was conceptualized through techno-distress and techno-eustress.	Burnout Scale, Job Satisfaction Scale, Technology Competence Scale and Technical Support Scale.	Descriptive statistics, Pearson's correlation analysis, confirmatory factor analysis, structural equation modelling, mediation and moderated mediation analyses.	Technostress creators increased burnout indirectly through techno-distress while simultaneously increasing job satisfaction through techno-eustress. Higher levels of technology competence and technical support weakened the negative effects of technostress, suggesting that organizational support and digital competence buffer its adverse consequences.	Level 6

Kräfte et al (2024), Germany	Descriptive cross-sectional study; 243 nurses employed in German hospitals.	Digital stressors were assessed through techno-invasion and social environment.	Emotional exhaustion, work-privacy conflict and health-oriented leadership.	Descriptive statistics, Pearson's correlation analysis, hierarchical multiple linear regression and moderation analysis.	Higher levels of digital stress, particularly techno-invasion, were significantly associated with emotional exhaustion and work-privacy conflict. Health-oriented leadership moderated several of these relationships, indicating that supportive leadership may reduce the negative effects of technostress on nurses' well-being.	Level 6
Sakrak & Dogan (2025), Turkey	Descriptive correlational cross-sectional study; 190 nurses working in pediatric clinics of a public hospital in Istanbul, Turkey.	Techno-stress Scale measuring nurses' perceived technostress associated with hospital information system use.	Hospital Information Systems Adoption Scale and Minnesota Job Satisfaction Questionnaire.	Descriptive statistics, Pearson's correlation analysis, linear regression, independent t-test, one-way ANOVA and Tukey-LSD post hoc analysis.	Greater hospital information system adoption was significantly associated with lower technostress and higher job satisfaction. The findings suggest that successful integration and acceptance of HIS can reduce technology-related stress while improving professional satisfaction among paediatric nurses.	Level 6
Shaban et al (2025), Egypt	Descriptive cross-sectional study; 180 critical care nurses from two hospitals in Damnhour City, Egypt.	Technostress Questionnaire assessing techno-overload, techno-complexity, techno-insecurity, techno-uncertainty and techno-invasion.	Copenhagen Burnout Inventory and Emotional Intelligence Scale.	Descriptive statistics, Pearson's correlation analysis, Structural Equation Modelling and bootstrapped mediation analysis.	Technostress was positively associated with burnout, whereas emotional intelligence was negatively associated with both technostress and burnout. Emotional intelligence significantly mediated the relationship between technostress and burnout, suggesting that strengthening emotional intelligence may reduce the negative psychological effects of technostress in critical care nurses.	Level 6

Sinmaz et al (2025), Turkey	Qualitative descriptive study; 11 operating room nurses working in robotic surgery units in Turkey.	Technostress was explored through semi-structured interviews focusing on nurses' experiences with robotic surgery technologies.	Experiences and perceptions related to technostress, including psychological responses, work-related challenges, perceived benefits of technology and coping strategies.	Qualitative analysis of interview transcripts.	Nurses experienced technostress primarily due to the complexity of robotic systems, fear of technical malfunctions, emergency situations, high equipment costs and unclear role responsibilities. Although robotic technology improved surgical precision, patient safety and workflow efficiency, it also increased cognitive workload and performance pressure. Continuous education, technical support and effective team communication were identified as key factors for reducing technostress.	Level 6
Wirth et al (2024), Germany	Cross-sectional online survey; 303 nurses employed in acute care hospitals in Germany with at least one year of work experience and working ≥10 hours per week.	Digital Stressors Scale assessing techno-complexity, techno-overload, techno-usefulness, lack of technical support and techno-unreliability.	Copenhagen Burnout Inventory and employer support for the use of digital technologies.	Descriptive statistics, Pearson's correlation analysis, hierarchical multiple linear regression, moderation analysis and qualitative content analysis of open-ended responses.	No significant differences in technostress were observed between nurses with and without leadership positions. Techno-overload and techno-complexity were significant predictors of burnout, while employer support moderated the relationship between lack of technical support and burnout. Nurses emphasized the importance of accessible technical support, regular training and organizational resources to reduce technostress and facilitate the use of digital technologies.	Level 6

Zhang et al (2025), China	Cross-sectional study; 672 nurses from five hospitals in Liaoning Province, China.	Technostress Scale including dimensions such as techno-induced invasion of privacy and techno-induced role ambiguity.	Maslach Burnout Inventory and Utrecht Work Engagement Scale.	Descriptive statistics, network analysis, bridge centrality analysis and subgroup comparison according to age.	Younger nurses experienced greater stress related to invasion of privacy, whereas older nurses were more affected by role ambiguity. Technostress was positively associated with job burnout and indirectly negatively associated with work engagement through burnout. The study also identified age-specific intervention targets, with cynicism being more important among younger nurses and emotional exhaustion among older nurses.	Level 6
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Table 3: Identified themes and synthesized findings

Themes	Synthesized findings	Studies
Theme 1: Technostress and psychological well-being	Emotional exhaustion and digital technologies; burnout and digital technologies; work-privacy conflict due to constant connectivity; fatigue and prolonged technology exposure; emotional response to technostress; technology addiction; compulsive technology use.	Lara-Aranda et al, 2025 ²⁹ ; Golz et al, 2024 ³⁰ ; Kräft et al, 2024 ³¹ ; Shaban et al, 2025 ³² ; Wirth et al, 2024 ³³ ; Zhang et al, 2025 ³⁴ .
Theme 2: Technostress and professional functioning	Reduced professional well-being; decreased work performance; impaired clinical efficiency; lower job satisfaction associated with technostress; reduced work engagement; digital workload; professional effectiveness.	Baek et al, 2025 ³⁵ ; Golz et al, 2025 ³⁰ ; Kopuz et al, 2025 ³⁶ ; Sakrak & Dogan, 2025 ³⁷ ; Zhang et al, 2025 ³⁴ .
Theme 3: Mechanisms linking technostress and nurses' outcomes	Emotional intelligence as a protective factor; burnout as an outcome; techno-distress; techno-eustress; technology demands.	Atalla et al, 2025 ³⁸ ; Kopuz et al, 2025 ³⁶ ; Shaban et al, 2025 ³² ; Zhang et al, 2025 ³⁴ .
Theme 4: Organizational and individual factors influencing the effects of technostress	Lack of technical support; rapid technological change; impact of employer support; health-oriented leadership; digital competencies and reducing of technostress; insufficient training; changing roles in technology rich environments; role of team communication; role of continuous education.	Baek et al, 2025 ³⁵ ; Golz et al, 2024 ³⁰ ; Kopuz et al, 2025 ³⁶ ; Kräft et al, 2024 ³¹ ; Sakrak & Dogan, 2025 ³⁷ ; Sinmaz et al, 2025 ³⁹ ; Wirth et al, 2024 ³³ .

Discussion

This scoping review aimed to examine the impact of technostress on nurses' well-being and professional functioning. Across the eleven included studies^{29–39}, the evidence suggests that technostress represents an important occupational stressor in modern nursing practice. The findings show that technostress affects both psychological outcomes and work-related functioning. As healthcare systems continue to integrate advanced digital technologies, the demands placed on nurses extend beyond clinical expertise to include continuous adaptation to complex digital environments. The evidence synthesized in this review suggests that such demands have

important psychological and professional impacts on nurses.

Technostress and psychological well-being

The findings from the first identified theme indicate that technostress is strongly associated with compromised psychological well-being among nurses. Several studies report positive associations between technostress, burnout, emotional exhaustion, and fatigue. A study by Golz et al.³⁰ demonstrated that higher levels of techno-overload and techno-complexity were significantly related to increased emotional exhaustion and reduced professional well-being. Similarly, Wirth et al.³³ found significant associations between techno-overload, techno-complexity, and

burnout, reinforcing the link between digital stressors and adverse psychological outcomes. These findings are supported by the conclusions of other authors. Abou Hashish and Alnajjar⁴⁰ found that technostress creators were positively associated with psychological strain while simultaneously reducing job satisfaction and organizational commitment. On the other hand, digital training, technical support, and organizational resources demonstrated protective effects among nurses.

The mediating role of emotional processes further strengthens this interpretation. Shaban et al.³² reported that technostress was positively correlated with burnout, while emotional intelligence significantly reduced burnout levels by mediating this relationship. In addition, Zhang et al.³⁴ found that technostress was positively and directly associated with job burnout and indirectly related to work engagement through burnout. Lara-Aranda et al.²⁹ further highlighted the presence of technostress and techno-addiction among nurses in their study, suggesting that prolonged exposure to digital demands may intensify affective strain. These findings indicate that technostress functions as a psychological burden that contributes to emotional exhaustion while simultaneously reducing well-being, particularly in high-intensity clinical settings.

The findings also suggest that the relationship between technostress and nurses' psychological well-being is multidimensional. While burnout and emotional exhaustion were the most consistently reported outcomes, several studies indicate that individual appraisal of technology, emotional resources, and organizational support determine the extent to which technological demands translate into psychological distress. Similar observations were reported by Tafwik et al.⁴¹, who found that frustration with healthcare technology was associated with emotional exhaustion, suggesting that technology-related frustration represents an important occupational stressor.

Technostress and professional functioning

In addition to psychological outcomes, technostress also affects nurses' professional functioning. Several studies confirm this and demonstrate that technostress influences work performance and job satisfaction. Baek et al.³⁵ reported that techno-complexity and techno-overload significantly affected nursing work performance, indicating that digital stressors may interfere with clinical efficiency and effectiveness. Similar findings were reported by Golz et al.³⁰, who found that technostress was negatively associated with job satisfaction, highlighting its influence on professional capabilities.

On the other hand, Kopuz et al.³⁶ highlighted the distinction between techno-distress and technoeustress, demonstrating that technostress creators increase burnout through techno-distress while simultaneously increasing job satisfaction through technoeustress. These indirect effects vary depending on nurses' technology competence levels, suggesting that the appraisal of technological demands influences professional outcomes among nurses. The negative influence of technostress on professional functioning appears to be consistent across different healthcare systems. Ficapal-Cusí et al.¹⁵ reported moderate levels of technostress among healthcare professionals in their study. Interestingly, familiarity with digital technologies and voluntary use of digital tools were associated with lower levels of technostress, suggesting that perceived control over technology may influence professional adaptation.

Findings from Sakrak and Dogan³⁷ indicate that effective technological integration may mitigate stress levels and support professional satisfaction, as they found that greater adoption of hospital information systems was associated with lower technostress levels and higher job satisfaction. Similarly, Wirkkala et al.¹² found that frustration with health information technology was associated with higher stress and emotional exhaustion. These findings suggest that digital technologies may primarily influence staff well-being rather than the perceived quality of care.

Mediating mechanisms linking nurses and technostress

Technostress affects the relationship between ICT demands and nurses' emotional labor, indicating that digital workload contributes to psychological strain, which subsequently affects nurses' emotional regulation at work³⁸. Similarly, Shaban et al.³² highlighted the role of emotional intelligence in reducing burnout among nurses experiencing technostress. Additionally, employer support significantly moderates the relationship between lack of technical support and burnout, highlighting the role of organizational resources³³.

Kopuz et al.³⁶ found that higher levels of technology competence weakened the indirect effects of technostress on job burnout and job satisfaction among nurses. These findings underscore the importance of individual skills in buffering the negative consequences of technostress. Furthermore, Kräft et al.³¹ emphasized the role of health-oriented leadership in moderating associations between technostressors and work–privacy conflict, suggesting that leadership practices significantly influence how digital stressors affect health outcomes among nurses.

These findings indicate that technostress should not be viewed as an isolated consequence of technology adoption but rather as part of a broader organizational process. Individual characteristics, including emotional intelligence and digital competence, interact with organizational factors, such as leadership, technical support, and workplace climate, influencing the extent to which technological demands lead to adverse psychological and professional outcomes among nurses. This perspective may explain why similar digital technology-related factors produce different outcomes across healthcare organizations.

Organizational and individual factors influencing the effects of technostress

The included studies indicate that technostressors are influenced by organizational conditions and individual levels of digital competency. Research by Sinmaz et al.³⁹ identified device

complexity, risk of malfunctions, emergency situations, and unclear role definitions as major sources of technostress. Insufficient training and limited experience have an important impact on anxiety, whereas continuous education, technical support, and effective team communication reduce technostress levels. In their study, Golz et al.³⁰ found that rapid technological advancements and insufficient technical support significantly contributed to nurses' perceived levels of stress.

Similar organizational determinants have also been identified in studies conducted outside hospital settings. For example, Thunberg et al.⁴² found that older healthcare workers, language barriers, and negative attitudes toward newly introduced welfare technologies contributed to increased technostress during technology implementation in long-term care facilities. The authors additionally emphasized that organizational investment in education and structured onboarding processes may reduce technostress during digital transformation. Similarly, Ficapal-Cusí et al.¹⁵ found that older nurses experienced significantly higher levels of technostress than their younger colleagues, while greater familiarity with digital technologies and adequate technical support were associated with lower technostress levels. These findings highlight the importance of continuous education for nurses during the digital transformation process.

Overall, the evidence gathered in this study demonstrates that technostress affects nurses' psychological well-being and professional functioning through direct, indirect, and moderated pathways. Technostress is associated with burnout, emotional exhaustion, and reduced job satisfaction, while also influencing work performance and engagement. However, individual competencies, emotional intelligence, employer support, and effective system adoption can mitigate these effects^{29–39}.

Study limitations and future research suggestions

This study has several limitations. Of the eleven studies included in this review, ten employed descriptive cross-sectional quantitative designs, and one study used a qualitative descriptive approach. The predominance of quantitative research, which was conducted in different settings, restricts the ability to generalize the findings to the broader nursing population. In addition, the limited number of qualitative studies represents a gap in the literature. As technostress is a complex phenomenon, further qualitative research would provide deeper insights into how nurses perceive and cope with technostress in everyday practice.

Additionally, all included studies were classified as level 6 evidence according to Polit and Beck. Higher levels of evidence, such as longitudinal or experimental studies, were not identified. Future research should therefore incorporate longitudinal, experimental, and mixed-methods study designs to better understand the mechanisms underlying technostress and to evaluate interventions aimed at reducing technostress in nursing practice.

Conclusion

Technostress represents a significant and multifaceted challenge within the nursing profession. The evidence suggests that technostress negatively affects nurses' psychological well-being, particularly through its associations with burn-out, emotional exhaustion, and work–privacy conflict. In addition, technostress influences professional functioning, including work performance, job satisfaction, and work engagement. The findings further suggest that the impact of technostress operates through psychological mechanisms and is shaped by individual and organizational factors.

Emotional intelligence, digital competence, employer support, leadership practices, and effective system implementation play important roles in moderating its effects. Strengthening digital competencies, ensuring adequate training and

technical support, clarifying professional roles, and promoting supportive leadership may contribute to safeguarding nurses' well-being and sustaining high-quality professional performance in increasingly technology-driven clinical environments.

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Conflict of Interest

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References

1. Hoffmann J, Reimer A, Mause L, et al. Driving new technologies in hospitals: association of organizational and personal factors with the readiness of neonatal intensive care unit staff toward webcam implementation. *BMC Health Serv Res.* 2022;22(1):787. doi:10.1186/s12913-022-08072-5
2. Yaqoob Mohammed Al Jabri F, Kvist T, Azimrad M, Turunen H. A systematic review of healthcare professionals' core competency instruments. *Nursing & Health Sciences.* 2021;23(1):87-102. doi:10.1111/nhs.12804
3. Schlicht L, Wendsche J, Melzer M, Tschetsche L, Rösler U. Digital technologies in nursing: An umbrella review. *International Journal of Nursing Studies.* 2025;161:104950. doi:10.1016/j.ijnurstu.2024.104950
4. Mohammadnejad F, Freeman S, Klassen-Ross T, Hemingway D, Banner D. Impacts of Technology Use on the Workload of Registered Nurses: A Scoping Review. *Journal of Rehabilitation and Assistive Technologies Engineering.* 2023;10:20556683231180189. doi:10.1177/20556683231180189

5. Bagherian B, Sabzevari S, Mirzaei T, Ravari A. Effects of technology on nursing care and caring attributes of a sample of Iranian critical care nurses. *Intensive and Critical Care Nursing*. 2017;39:18-27. doi:10.1016/j.iccn.2016.08.011
6. Hariyati RTS, Handiyani H, Wildani AA, Afriani T, Nuraini T, Amiruddin MH. Disparate Digital Literacy Levels of Nursing Manager and Staff, Specifically in Nursing Informatics Competencies and Their Causes: A Cross-Sectional Study. *J Healthc Leadersh*. 2024;16:415-425. doi:10.2147/JHL.S470456
7. Tischendorf T, Hasseler M, Schaal T, et al. Developing digital competencies of nursing professionals in continuing education and training – a scoping review. *Front Med (Lausanne)*. 2024;11:1358398. doi:10.3389/fmed.2024.1358398
8. Caton E, Philippou J, Baker E, Lee G. Exploring perceptions of digital technology and digital skills among newly registered nurses and clinical managers. *Nurs Manag (Harrow)*. 2024;31(1):27-33. doi:10.7748/nm.2023.e2101
9. Guillari A, Sansone V, Giordano V, Catone M, Rea T. Assessing digital health knowledge, attitudes and practices among nurses in Naples: a survey study protocol. *BMJ Open*. 2024;14(6):e081721. doi:10.1136/bmjopen-2023-081721
10. De Leeuw JA, Woltjer H, Kool RB. Identification of Factors Influencing the Adoption of Health Information Technology by Nurses Who Are Digitally Lagging: In-Depth Interview Study. *J Med Internet Res*. 2020;22(8):e15630. doi:10.2196/15630
11. Knop M, Mueller M, Kaiser S, Rester C. The impact of digital technology use on nurses' professional identity and relations of power: a literature review. *Journal of Advanced Nursing*. 2024;80(11):4346-4360. doi:10.1111/jan.16178
12. Wirkkala M, Wijk K, Larsson AC, Engström M. Technology frustration in healthcare – does it matter in staff ratings of stress, emotional exhaustion, and satisfaction with care? A cross-sectional correlational study using the job demands-resources theory. *BMC Health Serv Res*. 2024;24(1):1557. doi:10.1186/s12913-024-11906-z
13. Lobão C, Coelho A, Parola V, Neves H, Pereira Sousa J, Gonçalves R. Technostress in Nursing Education: A Scoping Review. *Nurs Rep*. 2025;15(7):248. doi:10.3390/nursrep15070248
14. Adel-Mehraban M, Mahdian A, Alavi M. TECHNO-STRESS: MODERN DILEMMA IN THE NURSING PROFESSION? Published online January 1, 2017.
15. Ficapal-Cusí P, Torrent-Sellens J, Yuguero O. Technostress among healthcare professionals in Spain: a cross-sectional survey on the impact of digital health tools. *BMJ Open*. 2025;15(9):e103783. doi:10.1136/bmjopen-2025-103783
16. Lucena JCR, Carvalho C, Santos-Costa P, Mónico L, Parreira P. Nurses' Strategies to Prevent and/or Decrease Work-Related Technostress: A Scoping Review. *CIN: Computers, Informatics, Nursing*. 2021;39(12):916. doi:10.1097/CIN.0000000000000771
17. Pirkkalainen H, Salo M, Tarafdar M, Makkonen M. Deliberate or Instinctive? Proactive and Reactive Coping for Technostress. *Journal of Management Information Systems*. 2019;36(4):1179-1212. doi:10.1080/07421222.2019.1661092
18. Tarafdar M, Cooper CL, Stich JF. The technostress trifecta - techno eustress, techno distress and design: Theoretical directions and an agenda for research. *Information Systems Journal*. 2019;29(1):6-42. doi:10.1111/isj.12169
19. Nastjuk I, Trang S, Grummeck-Braamt JV, Adam MTP, Tarafdar M. Integrating and synthesising technostress research: a meta-analysis on technostress creators, outcomes, and IS usage contexts. *European Journal of Information Systems*. 2024;33(3):361-382. doi:10.1080/0960085X.2022.2154712

20. Ibrahim RK, Al Sabbah S, Al-Jarrah M, et al. The mediating effect of digital literacy and self-regulation on the relationship between emotional intelligence and academic stress among university students: a cross-sectional study. *BMC Med Educ.* 2024;24(1):1309. doi:10.1186/s12909-024-06279-0
21. Alkhayyal S, Bajaba S. Countering technostress in virtual work environments: The role of work-based learning and digital leadership in enhancing employee well-being. *Acta Psychologica.* 2024;248:104377. doi:10.1016/j.actpsy.2024.104377
22. Mauno S, Herttalaampi M, Minkkinen J, Feldt T, Kubicek B. Is work intensification bad for employees? A review of outcomes for employees over the last two decades. *Work & Stress.* 2023;37(1):100-125. doi:10.1080/02678373.2022.2080778
23. Tennant R, Hiller L, Fishwick R, et al. The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): development and UK validation. *Health Qual Life Outcomes.* 2007;5(1):63. doi:10.1186/1477-7525-5-63
24. Zheng X, Zhu W, Zhao H, Zhang C. Employee well-being in organizations: Theoretical model, scale development, and cross-cultural validation. *Journal of Organizational Behavior.* 2015;36(5):621-644. doi:10.1002/job.1990
25. Sampaio F, Salgado R, Antonini M, et al. Workplace Wellbeing and Quality of Life Perceived by Portuguese Nurses during the COVID-19 Pandemic: The Role of Protective Factors and Stressors. *International Journal of Environmental Research and Public Health.* 2022;19(21). doi:10.3390/ijerph192114231
26. Cohen C, Pignata S, Bezak E, Tie M, Childs J. Workplace interventions to improve well-being and reduce burnout for nurses, physicians and allied healthcare professionals: a systematic review. *BMJ Open.* 2023;13(6):e071203. doi:10.1136/bmjopen-2022-071203
27. Tricco AC, Lillie E, Zarin W, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation. *Ann Intern Med.* 2018;169(7):467-473. doi:10.7326/M18-0850
28. Polit D, Beck CT. *Nursing Research: Generating and Assessing Evidence for Nursing Practice.* Tenth edition. 2017. <https://cmc.mar-mot.org/Record/.b54061398>
29. Aranda CL, Rodríguez AD, Rodríguez MP, Alonso PL. Technostress among nursing staff in the intensive care units in three hospitals in the southern area of Madrid. *EUROPEAN JOURNAL OF OCCUPATIONAL HEALTH NURSING.* 2025;4(2):23-48. doi:10.70324/ejohn.v4i2.72
30. Golz C, Eichenberger N, Luana M, Souissi SB, Bieri JS. Examining the Technostress Dimensions and Job Satisfaction in Nursing – A Cross-Sectional Study. In: *Innovation in Applied Nursing Informatics.* IOS Press; 2024:311-315. doi:10.3233/SHTI240159
31. Kräft J, Wirth T, Harth V, Mache S. Digital stress perception among German hospital nurses and associations with health-oriented leadership, emotional exhaustion and work-privacy conflict: a cross-sectional study. *BMC Nurs.* 2024;23(1):213. doi:10.1186/s12912-024-01825-z
32. Shaban M, Ezzelregal Abdelgawad M, Mohamed Elsayed S, Mohamed Abdallah HM. The mediating role of emotional intelligence in the relationship between technostress and burnout prevention among critical care nurses a structural equation modelling approach. *BMC Nurs.* 2025;24(1):255. doi:10.1186/s12912-025-02852-0
33. Wirth T, Kräft J, Marquardt B, Harth V, Mache S. Indicators of technostress, their association with burnout and the moderating role of support offers among nurses in German hospitals: a cross-sectional study. *BMJ Open.* 2024;14(7):e085705. doi:10.1136/bmjopen-2024-085705
34. Zhang H, Zhang Z, Xiao H, Qu R, Zhou Z. Age-group Variations in the Associations Between Technostress, Job Burnout, and Work Engagement Among Nurses: Evidence From a Network Analysis. *Asian Nursing Research.* 2025;0(0). doi:10.1016/j.anr.2025.06.002

35. Baek G, Lee YJ, Lee E. The Impact of Technostress, Nursing Informatics Competency and Knowledge-Sharing Behaviour on Nursing Work Performance Among Tertiary Hospital Nurses. *Journal of Advanced Nursing*. 2025;81(8):4734-4745. doi:10.1111/jan.16640
36. Kopuz K, Turgut M, Aydın G. Technostress among nurses: boon or bane? The moderated mediation model. *BMC Nurs*. 2025;24:1092. doi:10.1186/s12912-025-03721-6
37. Sakrak B, Dogan AK. The effects of hospital information system adoption on technostress and job satisfaction of nurses working in pediatric clinics. *BMC Nurs*. 2025;24(1):745. doi:10.1186/s12912-025-03371-8
38. Atalla ADG, Ali MSS, Mostafa WH. Technostress as a Bridge Between Information and Communication Technology Demands and Emotional Labor: A Cross-Sectional Study Among Egyptian Nurses. *International Nursing Review*. 2025;72(3):e70087. doi:10.1111/inr.70087
39. Sınmaz T, Kara Ö, SEYHAN AK E, Özbaş A. Experiences of robotic surgery nurses regarding technostress: a qualitative study. *J Robot Surg*. 2025;19(1):154. doi:10.1007/s11701-025-02320-6
40. Abou Hashish E, Alnajjar H. Technostress Creators and Inhibitors: Dual Impacts on Nurses' Psychological and Work Outcomes. *Nursing Open*. 2026;13(4):e70458. doi:10.1002/nop2.70458
41. Tawfik DS, Sinha A, Bayati M, et al. Frustration With Technology and its Relation to Emotional Exhaustion Among Health Care Workers: Cross-sectional Observational Study. *Journal of Medical Internet Research*. 2021;23(7):e26817. doi:10.2196/26817
42. Thunberg S, Johnson E, Ziemke T. Investigating healthcare workers' technostress when welfare technology is introduced in long-term care facilities. *Behaviour & Information Technology*. 2024;43(13):3288-3300. doi:10.1080/0144929X.2023.2276802