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Workplace Stress and Burnout among Employees in High-Technology and Research Institutions: A Review of Nursing Roles and Interventions

Ajesha Musa Paul[1] & Abdullahi Isah Kuba[2]
[1]National Space Research And Development Agency, Nigeria
[2]University of Teaching Hospital Gwagwalada, Nigeria
ajeshapaul9@gmail.com

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Abstract

Workplace stress and burnout represent substantial threats to employee well-being and organizational effectiveness in demanding high-technology and research environments. This systematic review examined the principal causes and consequences of workplace stress and burnout, with particular attention to nursing-led interventions for their prevention and management. Peer-reviewed studies were identified through searches of PubMed, Scopus, and Google Scholar using terms including "workplace stress," "burnout," and "nursing interventions." The reviewed evidence identified organizational, environmental, and psychological stressors as major contributors to burnout. Nursing-led interventions, particularly mindfulness-based stress reduction, cognitive behavioral therapy, and peer-support networks, were associated with reduced emotional exhaustion and improved job satisfaction. However, their implementation was constrained by organizational limitations, workforce adaptation challenges, and ethical concerns surrounding the integration of artificial intelligence into nursing practice. The findings further indicate that effective intervention requires organizational support,

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appropriate training for nurses in artificial intelligence, and the development of nursing-specific technological tools. This review demonstrates that addressing workplace stress and burnout in high-technology and research institutions requires an integrated approach combining evidence-based psychological interventions, peer support, technological preparedness, and supportive organizational policies. It contributes to the literature by consolidating nursing intervention strategies and identifying implementation priorities for improving employee well-being in technologically intensive workplaces.

Keywords: Burnout; High-Technology Institutions; Mindfulness-Based Stress Reduction; Nursing Interventions; Workplace Stress

Introduction

Stress and burnout in the workplace have emerged to be significant issues in contemporary organisations particularly in high-tech and research institutions where workers are constantly subjected to severe work pressures, innovation pressures, and hard deadlines. The necessity to maintain the productivity, accuracy, and competitiveness may subject workers to unceasing psychological and emotional pressure in such environments (Değer, 2024; Haruna, 2023). Consequently, workplace stress is no longer considered as a transient inconvenience but as an occupational health problem of serious consequences to both the employees and organizations.

A multidimensional phenomenon, burnout is associated with emotional exhaustion, depersonalisation, and diminished personal achievement and is a frequent consequence of untreated and long-term workplace stress (Nawaz et al., 2022; Tang et al., 2025; Gkontelos et al., 2025). This condition not only impacts on the emotional and mental wellbeing of workers but also their motivation, concentration, and performance quality. Burnout may undermine the institutional performance and individual productivity in high-tech and research environments, where mental activity, imagination, and critical thinking are the key factors (Ajayi and Udeh, 2024; Joe et al., 2025). Kumar et al. (2024) also indicate that the physical, emotional, mental, and social burnout-related exhaustion lower the capacity of employees to perform effectively according to the professional expectations.

Workplace stress and burnout are especially relevant to those work environments that are high-pressure like technology-driven organisations, laboratories, and research

institutions. These places of work are usually typified by extended working hours, performance appraisals, role ambiguity, excessive workloads, and the need to deliver quick outputs. These pressures often lead to chronic occupational stress, which, without an adequate coping mechanism, develops into burnout (Haruna, 2023; Cakirpaloglu et al., 2024). Jin et al. (2023) also highlight that emotional exhaustion is particularly exacerbated when the work demands are high, and the employees have low control over the work conditions. This renders the matter particularly relevant in the facilities where employees are obliged to work at high rates with a minimum amount of recovery time.

Nursing profession provides a valuable insight into stress and burnout at work since nurses often operate in challenging environments where stress impacts are both tangible and severe. Research has revealed that nurses are especially susceptible to burnout because of workload, emotional stress, role conflict, and the stress that comes with the responsibility of patient care (Kızılkaya, 2024; Wilton et al., 2024; Duasin et al., 2024). Emotional exhaustion, depersonalisation, decreased job satisfaction, lapsed care, and work performance have been associated with burnout amongst nurses (Novianti and Budiyanto 2025; Getie et al., 2025; Pakpahan et al., 2026). Their experiences also offer a valuable lesson on the factors and effects of work stress and also the importance of nursing professionals in prevention, support, and intervention efforts in the workplace.

Rising rates of stress and burnout among employees in high-tech and research settings have emerged as a highly significant challenge to the well-being of employees and organisational productivity. These industries require constant innovation, accuracy, and rapidness and frequently do not give workers ample time to rest, recuperate, or emotionally adapt. The longer the occupational pressure, the weaker the workers are to exhaustion, disengagement, and decreased professional performance (Deger, 2024; Ajayi and Udeh, 2024). This is not only harmful to individual health, but also compromises team work, imagination, quality of service, and output at the institution.

The issue is even more pressing in the context of research-related and healthcare-oriented facilities in which stress can have a direct impact on decision-making, healthcare outcomes, and safety. Constant exposure to stressors at work has been linked to emotional exhaustion and decreasing ability to cope, negative emotions, and diminished personal accomplishment in employees, especially nurses and other healthcare workers (Duasin et al., 2024; Grotowska et al., 2025). Failure to intervene effectively on this trend will lead to

an increase in absenteeism, low job satisfaction, low performance and poor organisational sustainability in institutions.

The primary goal of this review is to discuss the current information on stress and burnout at the workplace among the employees in high-tech and research institutions. In particular, the review aims at examining the significant causes of stress and burnout at work in such environments and discussing their consequences regarding the health of employees, their performance at work, and the productivity of the institution (Ajayi and Udeh, 2024; Joe et al., 2025).

The purpose of the review is also to evaluate the process of managing stress and burnout at the workplace by nursing professionals. Nursing professionals are uniquely placed in a position to contribute to employee well-being by providing health education, stress management tools, early signs of burnout, and advocacy of health in the workplace due to their frontline experience in dealing with stress-related outcomes in demanding care settings (Wilton et al., 2024; Novianti and Budiyanto, 2025). This role can be understood to create multidisciplinary approaches to stress reduction and better occupational health outcomes.

The paper is an important contribution to the literature since it has tackled the increasing problem of occupational health in industries that are important in the field of innovation, knowledge creation, and service provision. Research and high-tech organizations are very dependent on the intellectual, emotional, and physical strength of employees. The knowledge of the underlying causes and consequences of work stress and burnout is critical in protecting the health of the staff and ensuring they remain productive.

Moreover, the research has useful information in informing the organizational policies and practices. The results may be used to develop health and wellness interventions to create stress and burnout reduction strategies, such as workload management strategies, mental health assistance, staff counseling, and involvement of occupational health professionals in the institutional wellness programs.

The paper also highlights the critical importance of nursing professionals in stress and burnout management in the workplace. Their background in diagnosing the symptoms of burnout in their early stages and offering assistance makes them the major stakeholders in the promotion of healthier workplaces. This study proposes a more comprehensive and

unified approach to the issues of stress and burnout in high-demand professional environments by emphasizing their contributions.

Methodology

Review Design

The systematic review design is adopted in this review so that there is a complete and systematic review of the available literature. The methodical procedure enables the transparent and clear procedure of identifying, evaluating, and synthesizing the relevant studies referring to stress and burnout in the workplace, especially in the high-tech and research setting, and the role of the nursing professionals in managing the given problems.

Literature Search Strategy

A thorough literature review will be carried out in various academic databases to obtain the pertinent literature. The databases that will be used to locate peer-reviewed articles, grey literature, and other pertinent sources will be the following: PubMed, Scopus, Google Scholar. Specific keywords and Boolean operators will be used in the search to narrow the results:

Keywords: work stress, burnout, nursing interventions, high-tech institutions, research settings, occupational health.

Operators of the Boolean type: AND, OR (e.g., workplace stress AND burnout AND nursing interventions AND high-tech institutions).

These keywords will make sure that the review incorporates the relevant studies addressing not only the causes of stress and burnout but also the role of nursing professionals in solving the problem in the research and high-tech settings.

Inclusion and Exclusion Criteria.

Inclusion Criteria:

Research on stress and burnout in the workplace of a high-tech, research, or healthcare institution.

Studies concerning nursing interventions and their contribution to stress and burnout management at work.

Research that incorporates systematic reviews, empirical research, case studies, and qualitative research that do not leave insights on the occupational health, burnout, and stress in the identified contexts.

Exclusion Criteria:

Research that concerns stress and burnout at the workplace in non-high-tech or research workplace settings.

Steven et al. (2016) conducted a study that included articles that did not specifically investigate nursing interventions or burnout as a result of workplace stress.

Articles in non-English languages (unless a corresponding translation exists).

Research that does not contain adequate information about the causes and effects of burnout or is beyond the scope of this review.

Analysis and Extraction of Data.

A standardized data extraction form will be used to extract data on the selected studies. The major variables to be elicited are:

Obviously, the causes of burnout are job demands, role ambiguity, emotional exhaustion, etc.

Clicking on nursing roles: The role of nursing professionals in managing stress, burnout recognition, and support interventions.

Interventions: Interventions or programs that are applied to address stress and burnout in the workplace, especially interventions that target nursing.

Thematic synthesis will be used to analyze the data in order to identify patterns and shared themes in the studies. This qualitative study will assist in summarizing the key results and outlining the role of nursing professionals in dealing with workplace stress and burnout.

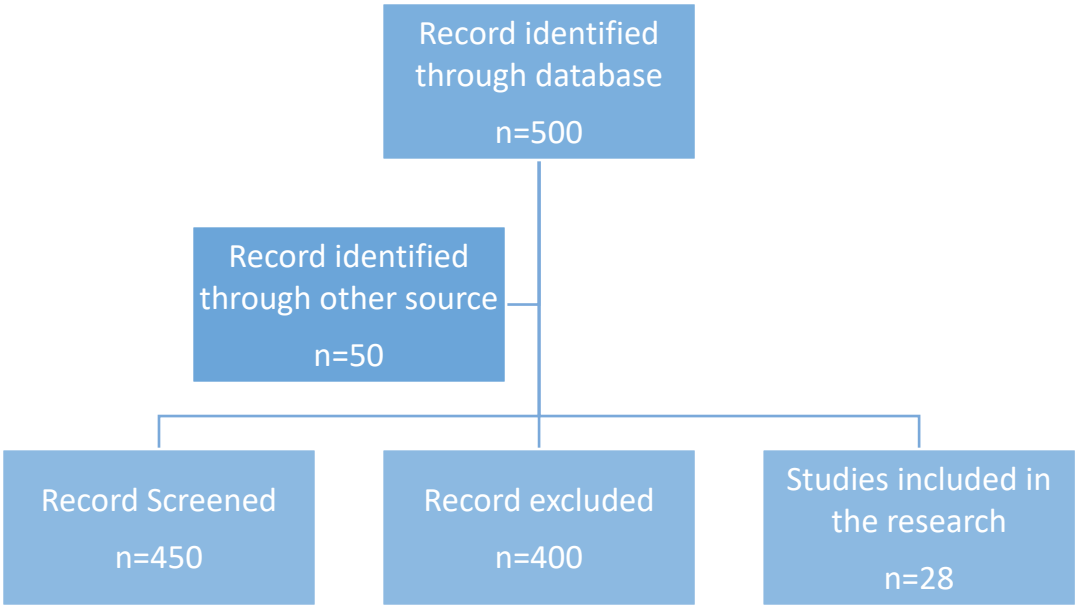


Figure 1. Prisma diagram

Stress and Burnout in Workplaces in High-Technology and Research Institutions

High-Tech and Research Institutions Overview

Technological and research-oriented institutions are characterized by a high-paced, dynamic, and, in many cases, high-pressure environment. The nature of these industries is that the innovation process is always needed; they have to be fast at adapting to new technologies, and they have to be productive and meet deadlines. This brings a professional environment where workers must work at high pressure, and there are high expectations to produce high-quality outputs within a relatively short period of time. In some industries, especially in the information technology, pharmaceutical, engineering, and healthcare areas, the adoption of the emerging technologies and the innovation is a fundamental part of operation in the day-to-day activities. This has resulted in employees in these industries struggling to keep abreast with the technological changes and at the same time manage heavy workloads, the growing complexity of their jobs, and high-stake work responsibilities (Ajayi & Udeh, 2024).

These organizations tend to promote the culture of the always-on, and in this case, the digital aspect of the work environment causes work and personal time to be indistinct. The growing use of digital tools, online teamwork, and remote work only adds to the escalation of work rhythms and longer working hours, which only exacerbates the level of

stress and the chance of burnout (Haruna, 2023). The digital technologies that have been introduced in these workplaces have also brought new stressors like technostress, which is the stress that is caused by the excessive use of technology in the workplace. This phenomenon encompasses techno-invasion, whereby work-related technology intrudes into personal life; techno-insecurity, where employees fear that their technological capabilities are inadequate; and techno-overload, where employees are overwhelmed by information and digital demands (Malik et al., 2025).

Reasons for Workplace Stress and Burnout.

High-tech and research institutions are also subject to workplace stress that is caused by various factors, including organizational and environmental stressors and psychological pressure. All these put together have created a situation where burnout is a reality and an increasing problem.

Organizational Stressors:

A major stressor in an organization is workload, which is usually aggravated by a set of tight deadlines, high expectations, and job demands, which keep on rising. In the high-tech industry, staff are often expected to balance several duties and assignments, and it is hard to achieve a balance between work and life (Ajayi and Udeh, 2024). Another type of stress is job insecurity, particularly when the organization is undergoing a restructuring or downsizing process, as workers fear the job security within a competitive and rapidly changing industry.

Environmental Stressors:

Environmental stressors, including noise in open-plan offices and social isolation in telecommuting settings, are some of the contributors to stress in these settings. This absence of face-to-face contact may cause a sense of disconnection, and strong noise or a disorganized workplace prevents concentration and performance (Hernandez et al., 2022).

Psychological Stressors:

Psychological stressors encompass the emotional burden on the employees, especially in the research environment where failure to perform to the expectations can be devastating. Moreover, dissatisfaction with the job (related to the absence of recognition, poor remuneration, and career development opportunities) has also been cited as a major reason causing burnout. There is also a tendency to feel unvalued and overworked, which

reduces the motivation and productivity of employees in these high-pressure settings (Kaptanoğlu, 2025).

Effects of Stress and Burnout.

Stress and burnout have severe and multi-dimensional impacts on the physical, mental, and emotional condition of employees and the overall performance of the whole organization, which are hard to overlook.

Influence on the Mental and Physical Health of the Employees:

Stress and burnout are the causes of various mental health problems such as anxiety, depression, and cognitive fatigue. Physically, workers can have chronic fatigue, headaches, sleeping disorders, and heart problems as the result of continuous exposure to stress. The healthcare industry, specifically, is particularly susceptible because the emotional burden of patient care may result in an increase in cases of stress-related diseases among workers (Kaltenegger et al., 2023).

Effect on Productivity, Innovation, and Job Performance:

The productivity is also considerably affected, as employees with burnout usually lose their concentration, become less creative, and lower the quality of work. Innovation is particularly in danger because burnt-out employees might not have the energy and mental clarity that they need to solve problems creatively and engage in constant learning. Job performance is generally reduced, and employees complain of reduced efficiency, increased error rate, and increased absenteeism. Unaddressed burnout may result in higher turnover as well, as employees are trying to get out of the unhealthy atmosphere (Malik et al., 2025; Pinto et al., 2024).

The culture of being always-on and the growing workload with the help of digital technologies also add to the blurring of work-life boundaries, contributing to the technostress even more. This, in its turn, increases the threat of burnout and adversely influences the well-being of employees and health of the organization.

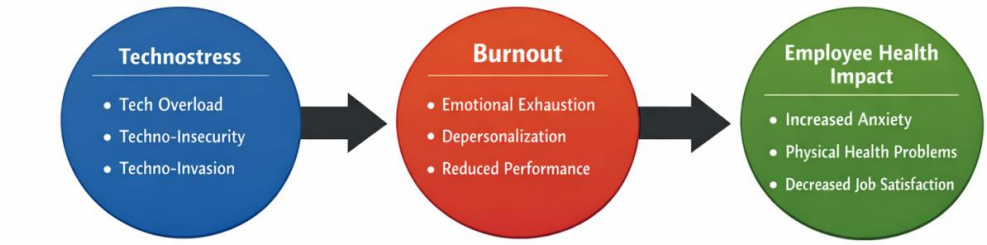


Figure 2: The Relationship Between Technostress, Burnout, and Employee Health

This figure illustrates the progression from technostress to burnout and its subsequent impact on employee health. It highlights how various forms of technostress, such as tech overload, techno-insecurity, and techno-invasion, can trigger emotional exhaustion and depersonalization, which are core components of burnout. As burnout intensifies, it leads to reduced work performance, which, in turn, negatively affects the physical and mental health of employees. The diagram emphasizes the interconnected nature of these stressors and their cumulative effect on an employee's overall well-being, ultimately leading to increased anxiety, physical health issues, and decreased job satisfaction.

Nursing Roles in Workplace Stress and Burnout

High-Tech and Research Institution Nursing Interventions

Nursing professionals are important in solving the problem of stress and burnout in the workplace, especially in the high-tech and research settings where the pressure on employees is usually overwhelming. Nursing interventions are effective concerning stress management and coping mechanisms, which offer both reactive and proactive techniques that enable employees to control the psychological stress. These measures are intended to develop psychological strength and improve coping skills in the challenging settings (Alrehali et al., 2022).

Nursing interventions are applied extensively with the use of individual and group therapies. Nurses usually offer therapeutic care to patients with stress or burnout, employing a method including cognitive behavioral therapy (CBT) and relaxation. These treatments assist the individual to re-appraise their stress reactions, handle their feelings, and alleviate anxiety (Silva et al., 2021). Group therapies, like peer support sessions, help workers to exchange experiences, share feelings, and discuss coping strategies collectively.

Preventative Measures

The preventative measures play a critical role in the reduction of the long-term consequences of workplace stress and burnout. Educational programs, stress relievers, and wellness programs are essential elements of such preventive programs. Stress management workshops, mindfulness training, and physical wellness programs such as yoga are

examples of wellness programs that enable employees to stay healthy in physical and psychological conditions (Pasay-an et al., 2025; Yosep et al., 2025).

The stress-reduction programs like frequent breaks, mental health days, and relaxation methods motivate the employees to have a day off from employment in order to refresh and alleviate stress. Educational programs with the purpose of developing sensitivity to stress and burnout and offering means of coping with the conditions are especially significant in work settings with high demands, e.g., high-tech and research facilities. Such programs usually aim at developing adaptive coping and personal awareness, which are critical to long-term resilience at work (Taribuka et al., 2025).



Figure 3: The Role of Nursing Interventions in Mitigating Stress and Burnout

This figure illustrates the interaction between individual-focused nursing interventions and organizational strategies in reducing workplace stress and burnout. It highlights that individual interventions like mindfulness-based stress reduction (MBSR) and cognitive behavioral therapy (CBT), when combined with organizational strategies such as wellness programs and peer support networks, create a comprehensive approach to mitigating stress. The diagram emphasizes the outcomes of these interventions, which include reduced stress, increased job satisfaction, and improved resilience. By showing how both personal and organizational approaches work together, the figure underscores the holistic nature of managing burnout in high-pressure environments like healthcare and research institutions.

Nursing-Specific Approaches

Specific nursing interventions to help fight workplace stress and burnout incorporate mental health nursing models that are customized to tackle the specific issues of the employees in high-stress settings. Mental health nursing models, including those applied in Mindfulness-Based Stress Reduction (MBSR), are specifically useful in assisting employees to cope with emotional fatigue and develop resilience (Poluboiartsev, 2023). This group of models focuses on the current moment, the breathwork, and self-compassion as some of the practices that decrease stress and enhance emotional control (Bhardwaj et al., 2024).

Mindfulness-based interventions have been shown to decrease emotional exhaustion and enhance job satisfaction in nursing personnel in high-stress care settings, including intensive care units (ICUs) (Joe et al., 2025). These methods are not only effective in reducing stress, but they also increase empathy and self-compassion, which are crucial attributes of a nurse who directly treats a patient in a high-pressure environment. Mindfulness-based interventions enable nurses to acquire adaptive coping skills such as active problem-solving and positive reframing, which are essential in overcoming occupational difficulties (Woods-Giscombé, 2021).

In addition to personal interventions, organizational approaches are also vital in the development of a good workplace. The psychological resilience of nursing professionals is enhanced by the introduction of peer support networks, supportive leadership, and professional development opportunities. These organizational-level measures are in addition to patient interventions, as they create a culture of care and support (Ali & Shaban, 2025; Golparvar & Parsakia, 2023).

Table 1. Nursing Interventions for Stress and Burnout

Intervention Type	Examples	Impact
Mindfulness-Based Stress Reduction	Mindfulness practices, breathwork, body scan exercises	Reduces emotional exhaustion, enhances job satisfaction
Cognitive Behavioural Therapy (CBT)	Reframing negative thoughts, relaxation techniques	Alleviates anxiety, improves emotional regulation
Peer Support Networks	Group therapy, support groups, shared experiences	Increases feelings of support, reduces isolation, fosters resilience
Wellness Programmes	Yoga, stress management workshops, physical activity	Improves physical and mental health, reduces work-related stress
Educational Initiatives	Workshops on stress, burnout prevention training	Increases awareness, promotes self-care, enhances coping skills

Measuring the Nursing Intervention Effectiveness.

A Review of the Existing Research on Nursing Interventions.

Nursing interventions as a way of dealing with workplace stress and burnout have been a well-researched area with many successful intervention strategies being produced. These interventions are often directed at the individual-level support as well as the systemic changes in the organization. One of the most common practices that have become a major study topic is Mindfulness-Based Stress Reduction (MBSR). It has been demonstrated that MBSR programs can help alleviate emotional exhaustion, anxiety, and burnout as well as enhance job satisfaction and overall well-being in nursing professionals (Poluboiartsev, 2023; Joe et al., 2025). Cognitive behavioral therapy (CBT) and relaxation methods are other intervention options that have shown positive outcomes in alleviating stress and burnout symptoms and enabling nurses to more effectively manage the emotional and psychological stress factors of their jobs (Silva et al., 2021).

Besides interventions based on individuals, peer support groups and group therapies have been identified to work effectively in diminishing the feelings of alienation and giving individuals a sense of belonging and experience. Research has also shown that wellness initiatives, comprising a mix of stress-reducing exercises like yoga and physical activity, help to promote better physical condition, reduce stress, and increase job satisfaction among nursing personnel (Taribuka et al., 2025; Pasay-an et al., 2025).

Although there are positive outcomes related to nursing interventions, there are still difficulties in their implementation, especially in high-tech and research settings, where the adoption of digital technologies and AI is increasingly becoming popular.

Stumbling blocks in the Implementation of Interventions.

Nursing interventions are also prone to a number of obstacles, especially in high-tech and research-intensive healthcare ecosystems. Organizational constraints are among the greatest issues, which entail a shortage of funding, time to train the staff, and adequate staff to help implement the interventions. As an example, the implementation of wellness programs or even the introduction of new models of therapeutic interventions, such as MBSR, in resource-limited environments may be obstructed by the shortage of financial and human resources (Shammari et al., 2022, p. 5).

Another challenge is the adaptation of the workforce to new interventions, in particular, to those using digital tools and technologies. Although the introduction of artificial intelligence (AI) into nursing practice is likely to make a major contribution to operational efficiency and clinical results, the change is perceived as a source of resistance among the staff. Numerous nurses lack proper training with the utilization of digital health technologies, and the emergence of AI-driven tools can raise doubts about their functions and tasks (Arab et al., 2025; Maleki et al., 2025).

The other obstacle is the ethical issues of AI implementation in healthcare. Problems like the bias in the algorithms, data privacy, and the possibility of technology misuse are also of concern. These ethical issues may slow down the adoption of AI in the nursing processes and prevent the creation of nursing-specific AI products (Bonfim & Nascimento, 2025; Olorunfemi and Ogwu, 2025). Additionally, AI systems must be strictly tested and validated by longitudinal or experimental research to demonstrate their effectiveness in real life and prevent possible harm to patients (Arab et al., 2025).

Suggestions to Improve the Nursing Roles.

To transform these obstacles and increase the efficiency of the nursing interventions, a number of recommendations are offered to enrich nursing positions, especially in the high-tech and research setting:

Integration of AI Training of Nurses: Nursing professionals must have extensive training on how to use digital health technologies, such as AI-based tools, to make sure that they can adjust and use the technologies in an efficient way. It will enable nurses to feel more secure in their duties and minimize opposition to the implementation of new tools (Wei et al., 2025).

Designing Nursing-Specific AI Solutions: The development of AI solutions in specific applications to nursing practices is a critical gap. Healthcare professionals, AI developers, and regulatory bodies should collaborate to develop special and easy-to-use AI tools that meet the needs of nursing staff in a specific manner (Maleki et al., 2025).

Establishing Ethical Rules in the AI Implementation: There should be clear ethical rules that should be put in place to regulate the implementation of AI in nursing practices. These principles must deal with such matters as data privacy, algorithmic transparency, and patient-centered care values, as AI tools are to be employed in an ethical and fair manner (Arab et al., 2025; Hassanein et al., 2025).

Increased Wellness Programs: Wellness programs must be incorporated in the day-to-day activities of the nursing personnel, with special emphasis on stress management, awareness of mental health, and self-care methods. Such programs are to be adjusted to the particular requirements of nurses operating in high-tech settings, and it can provide a more comprehensive approach to the well-being of employees (Taribuka et al., 2025; Yosep et al., 2025).

Enhancing Organizational Support: Healthcare organizations should focus on the psychological well-being of nursing practitioners by giving them sufficient resources and encouragement. It involves providing time to train, limiting overworking, and creating a positive atmosphere where the nurses will be able to exchange their experiences and seek assistance when necessary (Ali and Shaban, 2025; Golparvar and Parsakia, 2023).

The adoption of peer support systems: The adoption of organized peer support networks can also contribute to lessening isolation and enhancing the overall health of nursing personnel. Such networks can offer nurses a platform to communicate with one another, exchange coping mechanisms, and support each other emotionally (Cohen et al., 2023; Gökçe, 2024).

Through these barriers and the proposed recommendations, the nursing interventions will be better incorporated into the high-tech and research settings. This will not just change the mental and physical status of the nursing professionals but will also increase the outcome of patient care and organizational performance.

Table 2. Key Challenges in Implementing Nursing Interventions

Challenge	Description	Impact on Implementation
Organisational Constraints	Limited funding, lack of personnel, time constraints	Hindrance to effective intervention delivery
Workforce Adaptation	Resistance to new technologies, lack of training	Reduced efficacy of digital tools and new interventions
Ethical Considerations	Algorithmic bias, data privacy issues, misuse of AI tools	Delays in AI adoption, increased resistance, ethical concerns
Lack of Nursing-Specific AI Tools	Limited development of tools tailored to nursing practices	Insufficient support for nursing-specific needs in high-tech settings

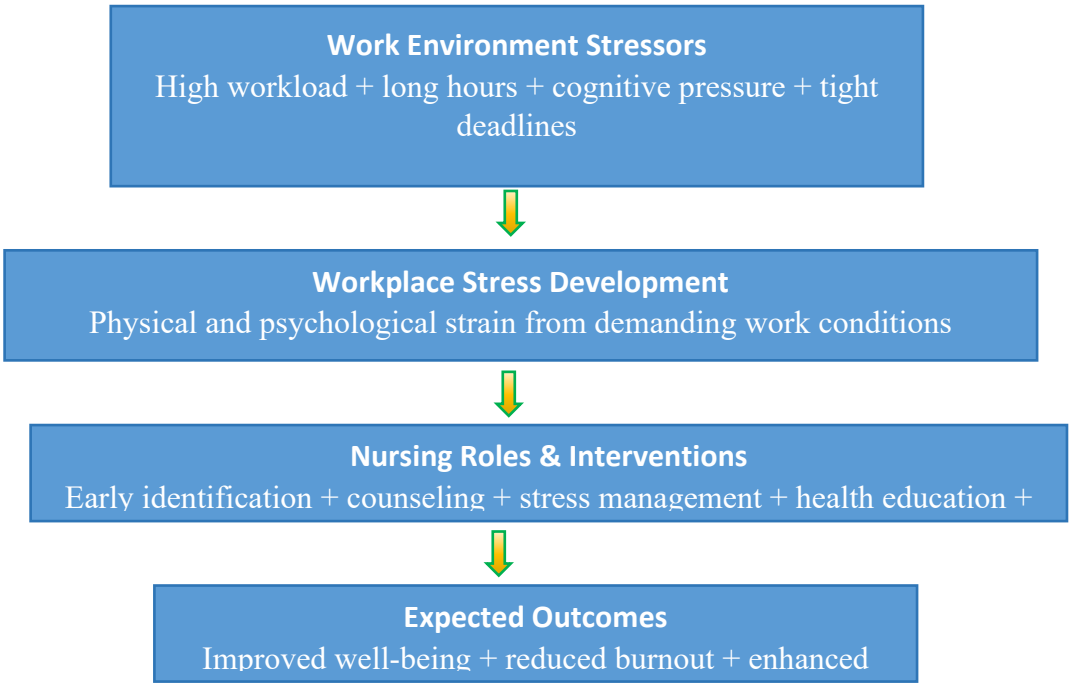


Figure 4: Framework for Enhancing Nursing Interventions in High-Tech and Research Environments

A figure illustrating the interrelationship between training and adaptation, wellness programs, ethical guidelines, and organizational support will provide a visual representation of how these elements work together to improve nursing interventions and overall outcomes in high-tech and research settings.

Conclusion

Workplace stress and burnout in high-tech and research settings involve nursing professionals. Nurses can alleviate the adverse consequences of stress and burnout through specific interventions, such as MBSR, CBT, and peer support groups. Nevertheless, organizational limitations, workforce adjustment, and ethical issues related to the use of AI are only a few challenges that should be overcome to maximize the efficiency of these interventions. Institutions may enhance the well-being of employees and their overall

performance by creating nursing-specific AI solutions, growing wellness initiatives, and establishing organizational support.

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