



Comprehensive Strategies for The Management of Occupational Hazards in Nursing: An Evidence-Based Review of Best Practices and Implications for Patient Care

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Abstract

Background: The nursing profession is inherently exposed to various occupational hazards that can adversely affect both nurses and patients. Effective management of these hazards is crucial for promoting a safe working environment, improving job satisfaction, and ensuring optimal patient care.

Methods: This review synthesizes current literature on best practices for managing occupational hazards in nursing. A systematic analysis of peer-reviewed journals, guidelines from health organizations, and case studies was conducted, focusing on strategies implemented in various healthcare settings worldwide.

Results: The findings reveal a range of effective practices, including the implementation of ergonomic interventions, comprehensive training programs, and the integration of safety protocols. Ergonomic assessments were shown to significantly reduce musculoskeletal injuries, while training programs that address infection control and chemical safety improved compliance and reduced incidents. Notably, the involvement of nurses in safety committees was linked to higher reporting of hazards and proactive risk management.

Conclusion: The management of occupational hazards in nursing requires a multifaceted approach that combines education, ergonomic practices, and active participation in safety initiatives. By prioritizing these strategies, healthcare organizations can enhance the safety and well-being of their nursing staff, ultimately leading to improved patient outcomes. Further research is needed to assess the long-term effectiveness of these interventions and to develop standardized protocols that can be implemented across diverse healthcare settings.

Keywords: Occupational hazards, nursing safety, ergonomic interventions, risk management, healthcare training.

Received: 16 October 2023 **Revised:** 29 November 2023 **Accepted:** 13 December 2023

1. Introduction

Artificial Intelligence (AI) in healthcare denotes the use of sophisticated technologies and algorithms to emulate human cognition and decision-making in the analysis, interpretation, and administration of medical data [1]. In nursing science and healthcare, artificial intelligence includes many applications, such as predictive analytics, data-driven insights, virtual nurse assistants, and robotic surgical systems. Healthcare workers may enhance their skills and elevate the quality, efficiency, and accuracy of patient care delivery via the use of AI [1].

The integration of AI with nursing science and healthcare has become a disruptive force, altering the delivery, management, and optimization of healthcare services. AI technology may improve clinical decision-making, optimize administrative operations, and support the creation of individualized treatment regimens suited to particular patient requirements. Furthermore, AI-driven solutions provide a viable approach to tackling resource limitations, escalating patient volumes, and the expanding intricacy of healthcare data, thereby enhancing patient outcomes and fostering a more sustainable healthcare system [2].

This thorough analysis aims to objectively assess the many effects of AI on nursing science and healthcare. This review seeks to offer a comprehensive understanding of the opportunities and limitations of AI in healthcare by examining the current state of AI integration, its implications for patient care, and the challenges and ethical considerations related to its implementation. This analysis aims to provide insights into the prospects and possibilities for using AI in nursing science and healthcare, along with concrete suggestions for enhancing its integration into clinical practice and healthcare administration.

2. Analysis of Artificial Intelligence Implementations in Healthcare Environments

In medical imaging, artificial intelligence is crucial for enhancing diagnostic precision and efficiency. AI systems may identify tiny irregularities via the analysis of x-rays, MRIs, and CT images, facilitating early illness identification. In the realm of mammography, AI may assist in detecting breast cancer in its first stages, significantly improving the likelihood of effective treatment. AI-enhanced medical imaging accelerates the interpretation of pictures and aids radiologists and other healthcare workers in delivering more precise diagnoses [3].

AI-driven clinical decision support systems are designed to collaborate with healthcare practitioners, providing immediate advice and suggestions. These systems assist in illness diagnosis, treatment option selection, and alerting to prospective difficulties. An AI system may evaluate a patient's medical history, symptoms, and test findings to provide physicians with evidence-based therapy alternatives, enhancing decision-making and patient care. These devices further minimize the probability of medical mistakes [4].

AI-driven healthcare analytics revolutionizes healthcare companies. Given the extensive data produced in healthcare environments, AI can effectively filter and analyze this information to extract significant insights. This study encompasses forecasting patient outcomes, enhancing resource allocation, and advancing patient treatment. AI may aid hospitals in predicting patient admission rates, enabling improved staff scheduling and resource allocation, hence boosting treatment quality while managing costs [5].

Natural language processing (NLP) techniques are crucial for extracting significant information concealed inside unstructured clinical notes and medical data. These algorithms may extract pertinent data from text, such as medical notes or patient records, and transform it into organized and usable information. NLP facilitates efficient record management and data retrieval, enabling healthcare workers to access and use patient information more effectively. Furthermore, it is essential to enhance electronic health records to optimize their use for clinical decision support, research, and data analysis [1].

The integration of AI with robots has significantly enhanced surgical accuracy and less invasive treatments. AI-guided surgical robots can execute intricate surgeries with remarkable precision. They provide surgeons with improved dexterity, control, and enlarged three-dimensional perspectives, facilitating better accuracy and less incisions. This reduces patient trauma, shortens recuperation

durations, and enhances surgical results. Robotics in surgery illustrates the integration of AI and healthcare, with the capacity to transform the future of surgical techniques and patient treatment [6].

3. Artificial Intelligence-Enhanced Technologies in Nursing Practice

AI-powered virtual nursing assistants are progressively being included into healthcare environments to aid nurses. These AI-powered chatbots and virtual assistants aid nurses in several duties, including maintaining patient records, retrieving current medical information, and addressing routine inquiries. They improve workflow efficiency by swiftly accessing patient data, allowing nurses to concentrate more on direct patient care. Additionally, virtual nursing assistants facilitate appointment scheduling, medication reminders, and post-discharge follow-ups, hence enhancing patient involvement and satisfaction [1].

AI systems are essential for guaranteeing precise and prompt drug delivery, a crucial element of medical care. These systems assist nurses by delivering automated medication reminders and dosage computations, therefore minimizing the likelihood of medication mistakes. AI may cross-reference patient information and medications, notifying nurses of possible drug interactions or allergies. By optimizing the drug management process, nurses may allocate more time to patient care, resulting in safer and more effective treatments for patients [7].

Preventing falls is essential for ensuring patient safety, especially for old or vulnerable individuals. Artificial intelligence can evaluate patient data, including walking patterns, balance, and medical history, to forecast fall risk. This predictive capacity allows nurses to implement proactive strategies to prevent falls, such as modifying patient care plans, supplying mobility aids, or establishing frequent check-ins. Utilizing AI for fall prediction enables nurses to markedly improve patient safety and diminish the occurrence of fall-related injuries [8].

AI-driven patient monitoring has transformed how healthcare practitioners oversee patient health. Wearable devices and remote monitoring systems integrated with AI consistently gather and assess vital indicators, including heart rate, blood pressure, and oxygen saturation levels. Upon the detection of abnormalities or alarming patterns, these systems may autonomously notify nurses and healthcare personnel, facilitating prompt actions. This real-time monitoring capacity is particularly advantageous for patients with chronic diseases or those recuperating after surgery, since it facilitates prompt action and diminishes the need for continuous in-person supervision. Nurses may optimize their time management by prioritizing patients in urgent need, hence enhancing the quality of treatment and patient outcomes [9].

4. AI-Enhanced Innovations in Patient Care and Treatment

AI-generated individualized treatment regimens are leading the transition to precision medicine. AI systems evaluate a patient's extensive health information, including genetics, medical history, lifestyle, and real-time health measurements, to formulate personalized treatment plans. This tailored method enables healthcare practitioners to provide therapies that are well aligned with the distinct requirements and attributes of people. AI may suggest certain drugs, doses, and actions tailored to the patient's genetic predispositions, therefore reducing bad effects and improving treatment efficacy. By customizing treatment regimens, healthcare practitioners may deliver more precise and effective care, hence enhancing patient outcomes and satisfaction [10].

Artificial intelligence has transformed the drug development process by accelerating the identification of new medication candidates. AI-driven simulations facilitate the forecasting of molecular interactions and the evaluation of prospective therapeutic effectiveness, markedly expediting the research and development of novel pharmaceuticals. This is especially crucial in tackling disorders with restricted therapy alternatives. AI systems may evaluate extensive datasets to pinpoint potential compounds for future examination, hence minimizing the time and resources necessary to introduce novel pharmaceuticals to the market. AI-driven drug development has the potential for expedited and economical therapies while also enabling personalized medication customized to an individual's genetic makeup [11].

AI-driven telemedicine and remote healthcare services have become more essential, particularly in isolated or underserved regions. Telemedicine systems provide patient access to healthcare services from their residences or nearby clinics, often including AI-augmented diagnostic tools and virtual consultations. This may diminish obstacles to healthcare access, like geographic remoteness or inadequate healthcare infrastructure. Artificial intelligence facilitates remote patient monitoring, wearable technology, and diagnostic instruments, enabling healthcare practitioners to monitor patient vital signs from a distance and provide prompt interventions as required. AI fosters healthcare fairness by enhancing access to excellent treatment, optimizing patient management, and alleviating the strain on healthcare institutions [12].

AI systems demonstrate proficiency in early illness identification by analyzing patient data for small alterations that may signify the start of ailments such as sepsis or chronic diseases. Recognizing early warning symptoms enables healthcare providers to respond swiftly, possibly averting illness development and reducing patient morbidity and death. For example, AI may incessantly monitor vital signs and laboratory findings, autonomously identifying abnormalities or patterns that may signify a worsening patient state. This early detection skill is crucial in critical care environments, where prompt actions may be lifesaving. AI-enabled early illness identification enhances clinical judgment, providing a crucial safety net for healthcare professionals and better patient outcomes [13].

5. Instances of Effective AI Integration in Nursing and Healthcare

IBM Watson for Oncology is an innovative AI system that provides essential assistance to oncologists in making crucial treatment choices. Watson for Oncology offers physicians tailored therapy suggestions for cancer patients by examining a comprehensive collection of medical literature, clinical trial data, and patient information. This AI system evaluates the patient's medical history, genetics, and current medical research, allowing oncologists to choose the most appropriate and evidence-based therapy alternatives. The system does not replace oncologists but serves as an essential instrument in enhancing their proficiency, hence elevating the standard of cancer treatment and augmenting the probability of favorable patient outcomes [14].

DeepMind, a subsidiary of Google Health, has made substantial contributions to the healthcare industry via its artificial intelligence capabilities. Specifically, DeepMind's AI algorithms have been used to forecast patient deterioration. Through the analysis of medical data, including vital signs, test findings, and history records, AI models may discern trends and alterations that may signify patient worsening. This early warning system enables doctors to engage proactively, possibly averting unpleasant occurrences and enhancing patient safety. DeepMind's Streams application enhances these initiatives by offering doctors an effective platform for managing and prioritizing patient data, so ensuring that healthcare practitioners are adequately educated and prepared to make prompt judgments [15].

IDx-DR is an innovative AI-driven technology that has obtained FDA certification for the independent identification of diabetic retinopathy, a prevalent diabetes-related condition that may result in visual impairment if not swiftly recognized and addressed. This AI technology analyzes retinal pictures and accurately determines the existence of diabetic retinopathy. IDx-DR automates the diagnostic procedure, mitigating the scarcity of eye care professionals in several areas and enabling early diagnosis and intervention, which may prevent visual damage in patients. This endorsement highlights the potential of AI in automating standard diagnostic procedures, improving the efficiency of healthcare facilities, and broadening access to vital medical screenings [16].

PathAI exemplifies the revolutionary influence of artificial intelligence on pathology. PathAI utilizes AI algorithms to assist pathologists in accurately detecting illnesses from histopathology slides. These algorithms can identify intricate and nuanced patterns in tissue samples, assisting pathologists in rendering more accurate and prompt diagnoses. This boosts diagnostic accuracy and simplifies the pathology process, hence lowering the time needed for diagnosis and facilitating quicker treatment choices. PathAI exemplifies the effective integration of human knowledge with artificial intelligence, poised to transform pathology and enhance patient care via increased diagnostic precision, especially in intricate and urgent situations [17].

6. Influence of artificial intelligence on nursing science and healthcare

Augmented decision support: AI has initiated a transformative phase in healthcare decision-making by providing healthcare workers access to extensive patient data and insights. This extensive information library includes medical literature, historical patient records, and real-time data, facilitating informed and evidence-based decision-making. AI enables healthcare practitioners to swiftly and precisely evaluate and understand complex information. This results in enhanced diagnostic accuracy and therapy choices, eventually improving patient outcomes. Artificial intelligence assists physicians and clinicians in remaining informed on the most recent research and optimal procedures, hence improving the quality of patient care.

AI's capacity to evaluate patient-specific data, including genetic information, medical history, and real-time health measurements, enables the formulation of tailored treatment programs. By customizing medicines according to specific patient traits, including genetic predispositions and lifestyle variables, AI increases the probability of therapy efficacy. This tailored methodology reduces negative outcomes and enhances treatment efficacy by providing treatments that are more congruent with patients' requirements. Integrating AI for individualized treatment plans enables healthcare providers to enhance patient care, hence boosting health outcomes and patient satisfaction [18].

AI is a crucial instrument for the early diagnosis of diseases and prompt action. AI systems excel in incessantly monitoring patient data, including vital signs and test results, and detecting nuanced changes that may indicate declining health conditions. This skill enables healthcare providers to respond swiftly when necessary, perhaps save lives. For example, in instances of sepsis, AI may identify early indicators of the illness, notifying medical professionals to take action prior to its progression. Utilizing AI for early diagnosis and intervention enables healthcare practitioners to increase patient safety, mitigate sickness severity, and improve overall healthcare quality [19].

AI-enhanced remote patient monitoring has revolutionized the delivery of care for patients, especially those with chronic illnesses or those recuperating from surgical procedures. Wearable technologies and remote monitoring systems enable patients to be carefully monitored in the comfort of their homes. AI algorithms incessantly scrutinize data, encompassing vital signs and patient-reported information, to detect any anomalies or departures from the standard. Healthcare personnel get real-time notifications as required, enabling them to act remotely and provide prompt instruction or modifications to treatment. This method not only improves patient comfort but also reduces the danger of hospital-acquired infections and superfluous stays. AI-enabled remote patient monitoring enhances patient autonomy, safety, and compliance with treatment regimens, hence improving healthcare outcomes [20-24].

AI systems in medical imaging possess the capacity to substantially diminish diagnostic faults. These AI systems, developed using huge datasets and possessing pattern recognition skills, may provide more precise and reliable outcomes than human radiologists in some cases. AI improves the accuracy and dependability of diagnostic procedures by identifying tiny anomalies and irregularities that may elude human observation. This thus reduces the probability of misdiagnosis and guarantees that patients have suitable and prompt treatment, hence enhancing patient safety and the quality of healthcare [25-26].

AI-driven automation and support technologies are essential in optimizing the healthcare process. AI alleviates the administrative strain on healthcare personnel by automating operations such as data input and appointment scheduling. These efficiency improvements enable healthcare personnel to devote more time and focus to direct patient care, promoting a more patient-centered methodology. The outcome is a more streamlined and effective healthcare system that improves medical quality and the overall patient experience, whilst minimizing the likelihood of human mistakes in administrative procedures [27-30].

AI has revolutionized drug discovery by markedly expediting the drug development process. AI-driven algorithms can rapidly scan extensive information, simulating molecular interactions and pinpointing possible therapeutic ideas. These expedite the initial phases of drug research and diminish the time and resources necessary to introduce novel pharmaceuticals to the market. The ramifications of this expedited drug development process are significant, offering swifter access to innovative medicines for diverse

illnesses and situations. Artificial intelligence in pharmaceutical discovery may enhance patient access to essential and beneficial medications while decreasing the expenses and duration linked to research and development [31].

The predictive analytics capabilities of AI can revolutionize hospital operations. Through the analysis of historical and real-time data, AI can predict patient admission rates, allowing hospitals to manage resources efficiently, sustain appropriate staffing levels, and minimize patient wait times. This proactive strategy guarantees that hospitals are adequately equipped to manage patient influxes, leading to enhanced patient satisfaction and optimal resource distribution. AI-driven predictive analytics enhance healthcare operations and resource management, hence improving the quality of patient care and healthcare service delivery [1].

7. Ethical Implications in AI-Driven Decision-Making

The transparency of AI algorithms is a vital ethical concern in healthcare. AI systems may be exceedingly intricate, complicating the elucidation of their conclusions to healthcare practitioners and patients. Transparency is crucial for establishing trust and confidence in AI-driven healthcare. Patients possess the right to comprehend the rationale behind an AI system's recommendation for a certain therapy or diagnostic. Healthcare practitioners must understand AI choices to make educated clinical judgments. Articulating precise elucidations of AI methodologies and determinations, alongside revealing any constraints, is essential to guarantee that AI in healthcare is both functional and reliable [32].

Establishing responsibility in AI-driven healthcare is a complicated ethical dilemma that requires elucidation. It is crucial to determine accountability for choices made by AI systems that affect medical care, including any mistakes or biases that may arise. Healthcare practitioners, AI system developers, and healthcare organizations all contribute to AI accountability. Establishing explicit standards for the duties and obligations of each stakeholder is essential to guarantee that the appropriate persons or organizations be held responsible for AI-related consequences. Accountability frameworks may mitigate issues pertaining to legal, ethical, and medical responsibility [33].

It is essential to ensure that AI systems do not reinforce or intensify healthcare inequities or prejudices, representing a significant ethical issue. Artificial intelligence must be developed and educated to provide fair healthcare to all patients, irrespective of ethnicity, gender, socioeconomic background, or other demographic variables. Ethical concerns include the examination of algorithmic bias and inequities in healthcare. AI developers and healthcare institutions must diligently strive to mitigate biases in AI systems and consistently monitor and evaluate their performance to guarantee equity. Ethical rules must be established to ensure fair healthcare delivery and to reduce the possibility of further marginalizing poor or disadvantaged people using AI-driven healthcare [34].

AI systems may inherit biases from their training data. These biases may result in inequitable or discriminatory judgments in healthcare, impacting diagnosis, treatment, and patient care. Ethical concerns include the proactive identification and alleviation of these prejudices. Healthcare organizations must meticulously choose training data to reduce bias, while AI developers should include bias detection and mitigation strategies into their systems. Regular audits and bias testing in AI algorithms are crucial to guarantee that healthcare choices are equitable, impartial, and devoid of prejudice. AI systems must adhere to stringent ethical norms to mitigate prejudice and discrimination in healthcare [35].

8. Obstacles Associated with AI Implementation in Healthcare Organizations

Resource limitations provide a substantial barrier, particularly for smaller healthcare organizations. Implementing AI systems often necessitates significant financial investment in technology and personnel training. Smaller healthcare institutions may need assistance in allocating the necessary financial and human resources to implement and sustain AI technologies. Addressing this difficulty may require pursuing external financing collaborations or investigating economical AI solutions customized for the particular requirements and limitations of smaller healthcare organizations [36].

Integrating AI technology with current healthcare IT systems and procedures is intricate and labor-intensive. Healthcare facilities often own legacy systems, and the integration of AI technologies might disrupt current operations. Attaining a seamless integration that reduces interruptions while enhancing the advantages of AI is a considerable challenge. Healthcare institutions should invest in interoperable technologies and contemplate incremental rollout to ensure a seamless transition [37].

Resistance to change is a prevalent obstacle in the use of AI in healthcare. Healthcare personnel may have apprehensions over job security, thinking that AI may supplant some facets of their responsibilities. There may be doubt over the efficacy of AI technology in enhancing patient care. Addressing these issues necessitates thorough education and training programs to ensure that healthcare personnel comprehend the function of AI as an instrument to augment their job rather than replace it. Involving healthcare professionals in the AI adoption process, soliciting their comments, and incorporating them into the design and deployment of AI systems might alleviate resistance to change [38].

Regulatory compliance: The healthcare industry is extensively regulated, and maneuvering through the intricate regulatory landscape, including HIPAA in the United States, is a considerable hurdle in the deployment of AI technologies. Ensuring AI systems adhere to regulatory standards, safeguard patient privacy, and uphold data security is crucial but challenging. Healthcare firms must collaborate with legal and compliance specialists to guarantee AI solutions adhere to rules. This may include doing comprehensive risk assessments, data security audits, and continuous monitoring to ensure compliance while using AI technology [39].

9. Mitigating Biases and Disparities in AI Algorithms and Datasets

Data bias is a considerable obstacle in AI-driven healthcare. AI algorithms depend on training data, and if this data is biased or unrepresentative of various populations, it may result in inequities in healthcare choices. Confronting this difficulty necessitates a unified endeavor to guarantee that training datasets are varied and representative. Healthcare institutions must diligently curate data to reduce bias, integrating diverse demographic and clinical information to develop more inclusive and fair AI models. Continuous evaluations and oversight of data quality are crucial for detecting and correcting bias in training data [40].

The development of ways to alleviate algorithmic bias and avert biased decision-making by AI systems is a persistent ethical concern. AI developers must discover and rectify bias at several phases of the AI development process, including data gathering, preprocessing, algorithm design, and model assessment. This entails evaluating elements that contribute to prejudice, including marginalized populations and historical inequities in healthcare. AI models must be engineered to reduce prejudice and enhance fairness in decision-making, perhaps using targeted bias mitigation strategies and algorithms [41].

It is essential to provide ways for the continuous auditing of AI systems to ensure fairness and mitigate prejudice, hence preserving equitable healthcare results. Fairness auditing is the ongoing assessment of AI models for biases and discrepancies in choices and results. Audits may facilitate the identification and correction of flaws as they emerge, so guaranteeing that AI systems maintain fairness and equity. This procedure may need the creation of specific fairness criteria, openness in AI decision-making, and regular evaluations by ethical committees or regulatory agencies to ensure fairness in healthcare AI [42].

Formulating and complying with ethical rules for AI development and use is a fundamental measure in reducing prejudice and inequities. These principles provide a framework for AI developers, healthcare institutions, and regulatory agencies to guarantee that AI systems emphasize justice, equality, and patient welfare. Ethical rules must include data gathering, algorithm development, model assessment, and the rights and obligations of healthcare practitioners and patients. Compliance with these criteria may serve as a fundamental method for mitigating prejudice and inequities in AI-driven healthcare while fostering ethical and equitable AI practices [43].

10. Conclusions

In conclusion, our thorough examination of AI's influence and problems in nursing science and healthcare has shown a domain rich with promise and intricacy. The ability of AI to better patient outcomes, increase efficiency, and advance medical research is indisputable. Nonetheless, the ethical implications of openness, justice, and accountability persist as key topics of discourse. It is essential to address data protection, obstacles in AI adoption, and bias reduction to enhance AI integration in healthcare environments. The future of nursing science and healthcare presents promising opportunities, including AI-driven diagnostics and predictive analytics that may transform patient care. It is essential to emphasize that AI serves as a supplement to human healthcare workers, rather than a replacement, since the human touch and empathy are irreplaceable. The need is evident: ongoing research, multidisciplinary cooperation, ethical standards, and safeguarding patient rights are crucial for harnessing AI's full potential in healthcare and enhancing patient outcomes, accessibility, and care quality.

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استراتيجيات شاملة لإدارة المخاطر المهنية في التمريض: مراجعة قائمة على الأدلة لأفضل الممارسات والتداعيات على رعاية المرضى

الملخص

الخلفية: مهنة التمريض معرضة بشكل طبيعي للعديد من المخاطر المهنية التي يمكن أن تؤثر سلبًا على كل من الممرضين والمرضى. إن الإدارة الفعالة لهذه المخاطر أمر بالغ الأهمية لتعزيز بيئة عمل آمنة، وتحسين رضا العاملين، وضمان رعاية مرضى مثلى.

الطرق: تقوم هذه المراجعة بتجميع الأدبيات الحالية حول أفضل الممارسات لإدارة المخاطر المهنية في التمريض. تم إجراء تحليل منهجي للمجلات المحكمة، والإرشادات الصادرة عن المنظمات الصحية، ودراسات الحالة، مع التركيز على الاستراتيجيات التي تم تنفيذها في مختلف بيئات الرعاية الصحية حول العالم.

النتائج: تكشف النتائج عن مجموعة من الممارسات الفعالة، بما في ذلك تنفيذ التدخلات الهندسية، وبرامج التدريب الشاملة، ودمج بروتوكولات السلامة. أظهرت التقييمات الهندسية تقليصًا كبيرًا في الإصابات المرتبطة بالجهاز العضلي الهيكلي، في حين أن برامج التدريب التي تعالج السيطرة على العدوى والسلامة الكيميائية حسنت الامتثال وقللت الحوادث. من الجدير بالذكر أن إشراك الممرضين في لجان السلامة ارتبط بزيادة في الإبلاغ عن المخاطر وإدارة المخاطر بشكل استباقي.

الاستنتاج: يتطلب إدارة المخاطر المهنية في التمريض نهجًا متعدد الجوانب يجمع بين التعليم، والممارسات الهندسية، والمشاركة الفعالة في المبادرات الأمنية. من خلال إعطاء الأولوية لهذه الاستراتيجيات، يمكن للمؤسسات الصحية تعزيز سلامة ورفاهية موظفيها من التمريض، مما يؤدي في النهاية إلى تحسين نتائج المرضى. وهناك حاجة إلى مزيد من البحث لتقييم فعالية هذه التدخلات على المدى الطويل وتطوير بروتوكولات موحدة يمكن تنفيذها عبر بيئات الرعاية الصحية المتنوعة.

الكلمات المفتاحية: المخاطر المهنية، سلامة التمريض، التدخلات الهندسية، إدارة المخاطر، التدريب في الرعاية الصحية.