Mindset to Action: Predicting Medical Students' Safety Practices in Clinical Environments via Protection Motivation Theory

Abstract

Aims: Occupational hazards in healthcare settings threaten the safety of medical students, whose protective behaviors during clinical training are vital for their well-being and patient care. This study applied Protection Motivation Theory (PMT) to identify key determinants of protective behaviors among medical students.

Methods: A descriptive–analytical (cross-sectional) study was conducted in 2025 among 420 medical students at Shahid Beheshti University of Medical Sciences, Tehran, Iran, selected through multistage cluster sampling. Data were collected using demographic and PMT-based questionnaires. Pearson correlation and linear regression analyses were performed in SPSS version 18, with a significance level of $p < 0.05$.

Findings: Participants had a mean age of 22.45 ± 3.9 years; 61% of the participants were female. Regression analysis showed that perceived susceptibility ($p = 0.003$), intention ($p < 0.001$), and behavior ($p = 0.002$) significantly predicted protection motivation. Self-efficacy ($p = 0.001$), intention ($p = 0.001$), and protection motivation ($p = 0.002$) significantly predicted protective behaviors.

Conclusion: Self-efficacy, intention, and protection motivation were the strongest determinants of students' safety behaviors. PMT-based educational interventions may improve protective practices and reduce occupational risks in clinical environments.

Keywords: Protective behaviors, Protective Motivation Theory, occupational hazards, self-efficacy, perceived vulnerability, perceived severity

Introduction

Occupational hazards remain a persistent challenge in occupational health and safety, particularly in healthcare, where nearly 44.5% of healthcare workers experience needlestick injuries annually (1). Occupational hazards continue to pose a persistent challenge in occupational health and safety, with potential consequences ranging from injuries and illnesses to long-term disability and workforce depletion (2, 3). Such hazards are particularly critical in healthcare, where exposure to physical, chemical, biological, ergonomic, and psychosocial risks is a daily reality for workers (4, 5). Ensuring safety in these environments is therefore a matter of both individual well-being and the sustainability of healthcare systems.

Global statistics emphasize the **s**ubstantial economic and human burden of occupational hazards. Work-related accidents and diseases are estimated to cost approximately 4% of the global GDP annually (3, 6). According to the International Labor Organization (ILO)**,** about 330 million occupational accidents occur worldwide each year, with nearly 160 million workers suffering from work-related illnesses, resulting in approximately 2 million deaths (7). The World Health Organization (WHO) also reports that workplace accidents lead to the loss of nearly 170 million workdays annually, with at least four workers injured every second (8).

These figures highlight the critical need for targeted preventive and protective strategies, particularly in healthcare settings, where workers—including medical students, nurses, and clinical staff—are exposed to a wide spectrum of physical, chemical, biological, ergonomic, and psychosocial hazards (9, 10). Protecting this workforce requires not only awareness of risks but also the adoption of effective safety practices, making the study of factors that influence protective behaviors highly relevant.

Studies indicate that unsafe behaviors account for the majority of occupational incidents, underscoring the importance of targeting human factors rather than environmental conditions alone (8). Consequently, analyzing the individual factors affecting healthcare workers is critical for understanding and preventing occupational accidents (11). However, simply increasing knowledge about occupational hazards is insufficient to guarantee safe practices, as behavior is shaped by multiple psychological and motivational determinants (12, 13). Consequently, selecting an appropriate model is a crucial step in implementing behavior change processes (14).

The Protection Motivation Theory (PMT) offers a robust framework for this purpose. It explains how individuals assess threats (via perceived susceptibility and severity) and evaluate coping options (via

self-efficacy, response efficacy, and response cost), forming intentions that guide behavior (15-19). PMT has been effectively applied to predict protective behaviors across domains like cancer prevention, HIV risk reduction, and workplace safety (20-22).

Medical students, as future healthcare providers, represent a unique high-risk group. Their limited clinical experience, combined with frequent exposure to invasive procedures and insufficient training in occupational safety, makes them especially vulnerable (23). For instance, occupational injury rates among Australian nursing students were reported at 13.9% with needles and standard syringes accounting for 37% of injuries (24). Similarly, a systematic review highlighted a high incidence of occupational contact dermatitis in certain groups of healthcare workers (25). Another systematic review documented the high prevalence of needle-stick injuries among healthcare personnel (1, 25, 26). In Iran, a study found that 71.1% of medical, dental, nursing, and midwifery students had experienced needle-stick injuries—considerably higher than rates reported in other countries (26).

These findings highlight a critical need to investigate the psychological and motivational determinants of protective behaviors in medical students. Specifically, examining constructs such as self-efficacy, intention, and protection motivation within the framework of PMT can provide insights into why students adopt—or fail to adopt—safety practices in clinical settings.

Accordingly, the present study aimed to identify predictors of protective behaviors among medical students confronting occupational hazards, using the Protection Motivation Theory as the guiding framework. The results can inform the design of targeted educational interventions to strengthen students' self-efficacy and motivation, ultimately promoting safer clinical practices and contributing to improved healthcare quality.

Materials and Methods

Study Design and Participants

This descriptive-analytical study was conducted in 2025 among students at Shahid Beheshti University of Medical Sciences (SBMU), Tehran, Iran. Using a 95% confidence level, an expected proportion of 0.5, and a margin of error of 0.05, the initial sample size was calculated as 400 participants. To accommodate a potential 5% non-response rate, the final sample size was increased to 420 students.

To ensure representation across the university's 13 faculties, 35 students were allocated to each faculty. Within each faculty, students from different departments were included, and participants were selected via systematic random sampling by choosing every 10th student from departmental lists.

Participants were eligible if they had successfully completed at least one academic term and one clinical course in a hospital setting. Prior to data collection, the objectives of the study were clearly explained, and participants were assured of the confidentiality of their responses. It was emphasized that the collected data would be used exclusively for research purposes and that results would be reported in aggregate form. Written informed consent was obtained from all participants in accordance with ethical guidelines.

Data Collection Instruments

Two instruments were employed for data collection in this study: a demographic information questionnaire and a Protection Motivation Theory (PMT)-based protective behavior questionnaire. The demographic questionnaire comprised eight items collecting data on participants' age, gender, field of study, educational level, marital status, and employment status.

Protective behaviors were assessed using the PMT questionnaire, adapted for the Iranian context (27). This comprehensive instrument measures key constructs of the theory, including Perceived Susceptibility, Perceived Severity, Self-Efficacy, Response Efficacy, Response Cost, Protection Motivation, Intention, and Action.

- **Perceived Susceptibility** evaluates the extent to which individuals perceive themselves as vulnerable to occupational illnesses. It consists of five items, for example: *"Anyone may contract illnesses resulting from working in a hospital."* Responses are recorded on a 5-point Likert scale from *Strongly Disagree (1)* to *Strongly Agree (5)*, yielding scores ranging from 5 to 25.
- **Perceived Severity** assesses the participants' understanding of the seriousness of health risks and potential consequences. It includes six items, such as *"Contracting an illness would impact my ability to perform tasks and lead to disability."* Responses use the same 5-point Likert scale, with a scoring range of 6–30.

- **Response Cost** examines perceived barriers to performing protective behaviors. Five items are included, for instance: *"Using personal protective equipment at work or in public places to prevent illness is time-consuming for me."* Scores range from 5 to 25 on a 5-point Likert scale.
- **Response Efficacy** measures the perceived effectiveness of protective behaviors in mitigating health risks. Five items assess this construct, e.g., *"Following protective recommendations and adhering to prevention principles can save my family money."* Responses are recorded on a 5-point Likert scale, ranging from 5 to 25
- **Self-Efficacy** evaluates confidence in one's ability to adopt and maintain protective behaviors. Five items are included, such as *"I am confident that I can prevent illness."* Scoring is conducted on the same 5-point Likert scale, ranging from 5 to 25.
- **Intention** consists of five items assessing the likelihood of engaging in protective behaviors, e.g., *"How likely are you to wash your hands after each patient care activity?"* Responses range from *Very Unlikely (1)* to *Very Likely (5)*, with scores between 5 and 25.
- **Protection Motivation** comprises four items evaluating determination to adopt protective measures, e.g., *"I intend to wash my hands with soap and water after every healthcare service."* Responses use a 5-point Likert scale from *Strongly Disagree (1)* to *Strongly Agree (5)*, scoring 4–20.
- **Action** assesses actual protective behaviors through five items, such as *"Do you use personal protective equipment in the workplace?"* Responses range from *Never (1)* to *Always (5)*, with total scores spanning, ranging from 5 to 25.

Validity and Reliability of the Instrument

The quantitative content validity of the instrument was assessed using the Content Validity Index (CVI) and Content Validity Ratio (CVR). Feedback was obtained from ten experts, including three specialists in health promotion, two in instrument design, three in nursing, and two in medical education. Necessary revisions were implemented both qualitatively and quantitatively based on their recommendations.

Quantitative content validity was evaluated by calculating the Content Validity Ratio (CVR) for each item to determine its necessity. Additionally, the Content Validity Index (CVI) was calculated to assess the relevance, clarity, and simplicity of each question. The Impact Score (IS) was also determined to ensure the final approval of all items included in the questionnaire.

To assess internal consistency, Cronbach's alpha coefficients were calculated. A pilot test with 30 participants, who were not part of the main study, was conducted. Cronbach's alpha values for the constructs were as follows:

Self-Efficacy: 0.97; Response Efficacy: 0.89; Perceived Susceptibility: 0.93; Perceived Severity: 0.96; Perceived Costs: 0.93; Intention: 0.92; Protection Motivation: 0.96; Action: 0.89.

These results indicate excellent internal reliability and confirm that the instrument is valid and reliable for assessing the intended constructs.

Questionnaires were administered face-to-face. Following ethical approval and receipt of the study's ethical code, researchers visited the university faculties to recruit participants according to the predefined inclusion criteria. Students were briefed on the study objectives and instructed to respond honestly.

Data Analysis

Data were analyzed using SPSS software (version 18). The normality of the data was evaluated using the Kolmogorov-Smirnov test. Descriptive statistics, including frequency, mean, and standard deviation, were calculated. Analytical statistics were used to examine relationships between constructs via Pearson's correlation and to identify predictors of protective behavior and motivation through linear regression analysis. A significance level of $p < 0.05$ was applied in all tests. No missing data were reported for any study variables; therefore, no imputation procedures were required.

Ethics approval and consent to participate

This study was approved by and registered with the Institutional Ethics Committee under the ethical code IR.SBMU.PHARMACY.1399.151. All procedures were conducted in accordance with the ethical standards of the institutional committee on human experimentation and the Declaration of Helsinki (1975, revised in 2000).

Prior to participation, all students received a clear explanation of the study objectives. Written informed consent was obtained from all participants. The questionnaires were administered face-to-face and were anonymous to ensure confidentiality. Participants were explicitly informed that their responses would be used solely for research purposes and reported in aggregate form.

Findings

Participant Characteristics

A total of 420 medical students participated in the study. The mean age of participants was 22.45±3.9 years. Among the participants, 61% were female, and 39% were male. Detailed demographic characteristics, including educational level, field of study, and marital status, are presented in Table 1. All students who were approached agreed to participate in the study, resulting in a 100% response rate. No individuals refused participation or were excluded.

Descriptive Statistics of PMT Constructs

Table 2 summarizes the mean scores and standard deviations for the Protection Motivation Theory constructs. The highest mean score was observed for Perceived Severity (23.76 ± 3.7), followed by Perceived Susceptibility (22.11 ± 2.4). Other constructs demonstrated the following mean scores: Response Efficacy (21.35 ± 2.5), Behavior (21.14 ± 2.8), Intention (19.32 ± 3.4), Self-Efficacy (17.43 ± 3.2), Protection Motivation (16.74 ± 2.6), and Perceived Cost (15.07 ± 4.1). No missing data were observed for any of the variables included in the descriptive analysis, and all participants provided complete responses for every item.

Correlation Analysis

Pearson correlation analyses revealed a significant positive relationship between Intention and Protection Motivation (Table 3). Additional correlations among constructs, including Self-Efficacy, Response Efficacy, Perceived Susceptibility, Perceived Severity, Perceived Cost, Intention, Protection Motivation, and Behavior, are provided in Table 3.

Predictors of Protective Behavior

Linear regression analysis identified Self-Efficacy , Intention , and Protection were significant predictors of protective behavior in the context of occupational hazards (Table 4).

Predictors of Protection

Similarly, regression analysis revealed that Perceived Susceptibility , Intention , and Behavior were significant predictors of Protection among students exposed to occupational hazards (Table 5).

Overall, the findings indicate that psychological constructs such as Self-Efficacy, Intention, and Protection Motivation play critical roles in determining students' engagement in protective behaviors in clinical settings. The strength of these relationships emphasizes the importance of targeting motivational and cognitive factors in interventions aimed at enhancing occupational safety practices among medical students.

Discussion

Healthcare systems, like other high-risk occupational settings, profoundly affect the well-being of their workforce. For medical students who combine academic study with direct patient care, safety concerns are especially pressing. International evidence shows that trainees are frequently exposed to hazards—ranging from slippery floors and poor lighting to excessive noise (28), and needlestick injuries (29)—that jeopardize both their safety and learning. Such risks highlight students' vulnerability during clinical placements and emphasize the need to integrate preventive and protective behaviors into medical and nursing curricula. Promoting these behaviors not only safeguards students' health but also fosters resilient professionals capable of maintaining high standards in future practice.

The Protection Motivation Theory (PMT) is one of the most influential frameworks for understanding preventive and protective health behaviors (3). It has been applied in diverse areas, including smoking cessation (4), cancer prevention (6), HIV risk reduction (7), physical activity (8), and healthy dietary practices (9). Its strength lies in emphasizing cognitive processes—such as threat and coping appraisal—that drive individuals' motivation to adopt self-protective behaviors (10). Drawing on this framework, the present study applied PMT to examine medical students' protective behaviors against occupational hazards, thereby extending its use to academic and clinical training contexts where young professionals encounter unique risks.

The present study found that among the constructs of the Health Belief Model, Perceived Severity had the highest mean score among medical students, reflecting their strong awareness of occupational hazards. This perception is likely shaped by both extensive media coverage and clinical training, which sensitize students to the inherent risks of their profession (30, 31). Consistent with previous findings, medical students generally acknowledge occupational risks in clinical environments, and this awareness facilitates preventive behaviors (32). Media reports highlighting the challenges faced by healthcare professionals may further strengthen professional identity and motivate students to adopt protective measures (30, 31). These results point to the need for targeted interventions by

health authorities and educators that not only provide information about risks but also leverage risk perception as a driver for preventive behavior, ultimately fostering safer clinical environments.

The present study revealed a significant positive association between Intention and Protection Motivation, suggesting that students who feel more vulnerable to occupational hazards are more likely to form stronger protective intentions and engage in preventive behaviors. This finding is consistent with previous studies, which show that protection motivation directly influences the intention to adopt safety measures (33) and is linked to greater preventive action, as reported in research on rural women and skin cancer prevention (34). Despite differences in context, the evidence collectively supports the premise that perceived vulnerability and protection motivation are central drivers of preventive behavior. These findings highlight that fostering protection motivation and risk perception is not merely an educational necessity but a strategic investment in shaping resilient future professionals. By embedding such approaches within medical curricula, institutions can cultivate a culture of safety that extends beyond individual students to the broader healthcare system, ultimately contributing to sustainable improvements in clinical practice and patient care.

This study confirmed that Self-Efficacy, Intention, and Protection Motivation are key predictors of protective behaviors, consistent with findings from Okuhara et al. and Bashirian et al. (35, 36). The strong positive correlation between self-efficacy and behavioral intention highlights the pivotal role of individuals' confidence in performing preventive actions: the more they trust their ability to carry out protective measures, the more likely they are to translate intentions into actual behavior. These insights underscore the value of interventions that build self-efficacy among medical students. Through practical training, constructive feedback, and reinforcement, educators can foster confidence, strengthen motivation, and increase adherence to protective practices. Embedding protection motivation concepts within curricula may further ensure that both intention formation and behavioral performance are systematically supported in clinical environments.

Among the predictors examined, self-efficacy emerged as the strongest and most consistent determinant of protective behaviors. This suggests that students who both recognize their vulnerability to occupational hazards and feel confident in their ability to act are substantially more likely to translate intentions into preventive practices. These findings align with recent evidence underscoring the central role of self-efficacy in health-related behaviors. For example, Kusol et al. reported that higher perceived self-efficacy significantly increased nursing students' adoption of preventive measures during the COVID-19 pandemic (37). Likewise, Dębska-Janus et al. demonstrated that self-efficacy, together with optimism, strongly influenced health behaviors among Polish health sciences students (38). Collectively, this evidence reinforces the view that strengthening self-efficacy is a cornerstone of effective interventions aimed at promoting protective behaviors in medical education.

Building on this evidence, enhancing self-efficacy through targeted educational and psychological strategies should be considered a priority. Practical training, guided simulations, constructive feedback, and reinforcement approaches can all foster students' confidence and increase their adherence to protective measures in both clinical and workplace environments. Ultimately, embedding self-efficacy as a core component of training curricula not only improves individual compliance but also contributes to cultivating a culture of safety that minimizes occupational risks in the long term.

This study identified perceived vulnerability, intention, and behavior as key predictors of protection motivation among medical students. The greater the students' perceived susceptibility to occupational hazards, the stronger their protection motivation, which subsequently drives preventive behaviors. Interestingly, Maleki et al. reported that self-efficacy, rather than perceived vulnerability, had the strongest association with protection motivation (36). Such discrepancies may reflect differences in students' awareness of occupational risks, quality of workplace training, or cultural and contextual factors, highlighting the multifactorial nature of protection motivation. Both cognitive factors (e.g., perceived vulnerability) and personal resources (e.g., self-efficacy) appear to jointly influence protective behaviors.

These findings emphasize the need for comprehensive educational interventions that enhance both awareness and confidence. By simultaneously addressing perceived risks and self-efficacy, training programs can effectively strengthen students' protection motivation and encourage adherence to preventive practices in clinical and workplace settings. In high-stress hospital environments, where occupational hazards are inherent, higher perceived severity is closely linked to vulnerability, shaping intentions and behaviors. This aligns with previous research demonstrating that heightened risk

perception promotes adherence to safety measures, including protocols and personal protective equipment (39). Overall, these results support the use of the Protection Motivation Theory as a framework for designing interventions that enhance awareness, self-efficacy, and safe practices in clinical training.

Limitations

Despite its strengths, several limitations should be considered. First, the study was conducted at a single university, which may restrict the generalizability of findings to other medical schools with different educational environments or cultural contexts. Second, the reliance on self-reported data could introduce recall bias and social desirability bias, as participants may overreport behaviors perceived as favorable. Finally, although key constructs of the Protection Motivation Theory were assessed, other potential factors influencing protective behaviors—such as peer influence, institutional safety culture, and prior clinical experience—were not evaluated.

Recommendations

Based on the findings of this study, several practical and educational strategies can be implemented to enhance protective behaviors among medical students. Structured educational sessions and interactive discussions can help students accurately perceive the severity and potential consequences of occupational hazards, thereby increasing their motivation to adopt protective measures. In parallel, practical simulations, guided exercises, and feedback mechanisms can strengthen students' confidence in their ability to perform protective behaviors effectively. Integrating reflective activities, scenario-based training, and reinforcement strategies can further assist students in translating their intentions into consistent protective practices in clinical settings. For future research, multi-center studies with larger and more diverse student populations are recommended to improve the generalizability of findings. Additionally, longitudinal and mixed-method approaches could provide deeper insights into the dynamic relationships between perceived risk, self-efficacy, and protective behaviors over time.

Relevance for Clinical Practice

These findings indicate a need for training institutions and teaching hospitals to strengthen institutional safety systems that support medical students' protective behaviors during clinical placements. Hospital safety officers, clinical supervisors, and training coordinators can play a critical role in enhancing students' self-efficacy and intention to adhere to protective practices by ensuring access to personal protective equipment, structured supervision, and clear safety protocols. The integration of PMT-based strategies, such as hands-on safety training, supervised performance of protective procedures, and feedback-driven skill reinforcement, can improve students' confidence and compliance with occupational safety measures. Implementing these approaches within clinical training environments may reduce occupational risks such as sharp injuries, infections, and exposure to hazardous conditions. Strengthening institutional responsibility for student safety during clinical training contributes to safer learning environments and supports broader occupational health and safety goals within healthcare settings.

Conclusion

This study, guided by Protection Motivation Theory (PMT), identified self-efficacy, intention, and protection motivation as significant positive predictors of protective behaviors among medical students facing occupational hazards. Self-efficacy emerged as the most influential factor, indicating that confident students are more likely to act on their intentions. These findings underscore the importance of fostering self-efficacy through targeted, theory-based educational interventions to enhance preventive behaviors, reduce hazard exposure, and promote overall safety in clinical training environments. Ultimately, empowering students contributes to their well-being and safer institutional safety systems.

Acknowledgments

We would like to extend our gratitude to the student union council and the nursing student representatives for their cooperation in the implementation of this project.

Ethical Permissions

This study was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (Ethical code: IR. SBMU.PHARMACY.1399.151). All procedures involving human participants were conducted in accordance with the Declaration of Helsinki.

Author contributions