

Outcomes of AI-Assisted Interventions to Reduce Nurse Burnout

Amna Nawaz, Qamar Un Nisa, Yasmin Tahira, Shazia Taj*

College of Nursing, Nishtar Medical University and Hospital, Multan, Pakistan

*Corresponding author's email address: shazyiataaj80@gmail.com

(Received, 24th June 2025, Accepted 2nd November 2025, Published 30th November 2025)

Abstract: Burnout among nurses is a critical global concern that affects patient safety, job satisfaction, and healthcare quality. Artificial intelligence (AI)-assisted programs have emerged as innovative tools to support mental health and reduce occupational burnout through personalized monitoring and adaptive interventions. **Objective:** To evaluate the outcomes of artificial intelligence-assisted programs to mitigate burnout in nurses. **Methodology:** A case-control study was conducted in the Nursing Department of Nishtar Hospital, Multan, from March 2024 to March 2025. A total of 100 nurses working in the hospital for 1 year were included in the study. Nurses were divided into two groups: Group A (case group), comprising 50 nurses attending an AI-assisted burnout intervention program, and Group B (control group), comprising 50 nurses attending a self-selected burnout intervention program. The primary outcome was measurement of burnout on personal, work-related, and patient-related levels. **Results:** Patient-related burnout changed significantly between groups ($F=7.68$, $p=0.001$) and time ($F=15.81$, $p<0.0001$) over the duration of intervention. The same pattern was observed for personal burnout between groups ($F=10.89$, $p<0.0001$) and over time ($F=17.7$, $p<0.0001$). Nurses of both groups had significantly reduced job stress after either intervention (Group A: $t=2.99$, $p=0.005$; Group B: $t=2.68$, $p=0.010$). The stress response was also reduced considerably between both groups after programs (Group A: $t=1.99$, $p=0.040$; Group B: $t=2.82$, $p=0.008$). **Conclusion:** AI-assisted interventions significantly reduce nurses' burnout, especially at the personal and patient levels.

Keywords: Burnout, Intervention, Nursing, Nurses

[How to Cite: Nawaz A, Nisa QU, Tahira Y, Taj S. Outcomes of AI-assisted interventions to reduce nurse burnout. *Biol. Clin. Sci. Res. J.*, 2025; 6(11): 1-4. doi: <https://doi.org/10.54112/bcsrj.v6i11.2021>

Introduction

Nursing is one of the most stressful jobs involving significant emotional and physical labor, putting nurses at risk of burnout. A global burnout rate of 30% has been reported in nurses, while in Pakistan, 48.6% of nurses were found to be burned out (1, 2). It can be attributed to a stressful work environment, excessive workload, inadequate compensation, and a nurse-to-patient ratio of 1:40, which is significantly higher than in developed countries. Burnout not only affects nurses' work performance and health but also the quality of care and patient turnover rates.

Research has shown that techniques like laughter therapy, meditation, reflective storytelling, and acceptance & commitment therapy reduce the impact of burnout (3, 4). Although these methods are effective, they are inflexible and follow standard procedures that do not address nurses' diverse experiences. Artificial intelligence automated interventions have emerged as a tailored tool to enhance outcomes personalized for each user (5, 6).

This study evaluated the outcomes of artificial intelligence-assisted programs to mitigate burnout in nurses.

Methodology

A case-control study was conducted in the Nursing Department of Nishtar Hospital, Multan, from March 2024 to March 2025. A total of 100 nurses working in the hospital for one year were included in the study. Interns, new joiners, those not involved in direct patient care, and those with experience in behavioral therapy were excluded from the analysis. All participants verbally agreed to take part in the study, which was approved by the hospital's ethical committee.

All participants provided their demographic data, such as age, gender, and social status, and work details, including experience, department, job title, shift type, overtime during the last month, and turnover intention. Nurses were divided into two groups: Group A (case group), which included 50

nurses attending an AI-assisted burnout intervention program, and Group B (control group), which included 50 patients attending a self-chosen burnout intervention program.

For the case group, participants underwent four interventions for 1 month: acceptance and commitment therapy, laughter therapy, mindfulness meditation, storytelling, and reflective writing. The intervention consisted of three weekly sessions lasting for 10-15 minutes. Nurses performed mindfulness meditation by following the body movements and breathing techniques, and they meditated through video instructions. Acceptance and commitment therapy was done by acknowledging thoughts and emotions. Nurses were shown a video about other nurses' experiences, and they reflected on their own experiences for storytelling and reflective writing. For laughing therapy, nurses performed activities that induced laughter through video instructions.

The similarity scores and burnout patterns were entered into the AI algorithm for analysis. The similarity score was calculated using 22 variables, including demographics, work-related factors, job stress, stress response, and coping strategies. The minimum score was one, and the maximum score was 22. Similarity in burnout patterns was found by comparing the rank of burnout dimensions. AI recommended a 2-week program based on this data, after which the burnout level was analyzed again. If a 50-point reduction was observed, the second 2-week program was designed based on the same data. In the control group, nurses chose any intervention among the four programs conducted twice over 1 month. The primary outcome was measuring burnout on personal, work-related, and patient-related levels. The 19-item Copenhagen Burnout Inventory was used, which included a Likert scale from 1 to 5, with 5 being 100% burnout and 1 being 0% burnout. The secondary outcomes were job stress, stress response, and coping strategy. Data was measured at the start of the study, after 2 weeks, and then after 4 weeks.

Data analysis was done using SPSS version 23. Variables were expressed using descriptive statistics. The impact of intervention on burnout was



analyzed by ANOVA, and the relationship with other variables was evaluated by the Scheffe test and t-test.

Results

Table I shows demographic and baseline burnout parameters of nurses. There was no significant difference between these parameters between the two groups. In Group A, 19 (38%) nurses underwent laughter therapy, 12 nurses (24%) underwent acceptance and commitment therapy, 7 (14%) did storytelling and reflective writing, and 11 (22%) did mindfulness meditation. In Group B, 24 (48%) chose laughter therapy, 11 (22%) chose acceptance and commitment therapy, 7 (14%) chose storytelling, and 8 (16%) chose mindfulness meditation.

ANOVA test results in Table II show a significantly lower personal and patient-related burnout score in the case group than in the control group. Patient-related burnout changed significantly between groups ($F=7.68$, $p=0.001$) and time ($F=15.81$, $p<0.0001$) over the duration of intervention. The same pattern was observed for personal burnout between groups ($F=10.89$, $p<0.0001$) and over time ($F=17.7$, $p<0.0001$). Work-related burnout did not change significantly.

Nurses of both groups had significantly reduced job stress after either intervention (Group A: $t=2.99$, $p=0.005$; Group B: $t=2.68$, $p=0.010$). The difference in job stress pre- and post-intervention was not significant. The stress response was also significantly reduced between both groups after programs (Group A: $t=1.99$, $p=0.040$; Group B: $t=2.82$, $p=0.008$). The difference in stress response pre- and post-intervention was significant, especially in Group B ($F=3.11$, $p=0.020$).

Table 1: Nurses' demographics and study variables

Characteristics	Group A (n=50)	Group B (n=50)	X2 or F	P
Mean age	30.62 ± 3.77	30.91 ± 3.89	0.63	0.60
Younger than 30 years	17 (34%)	15 (30%)	1.90	0.41
30 years or older	33 (66%)	35 (70%)		
Gender			3.58	0.22
Male	5 (10%)	4 (8%)		
Female	45 (90%)	46 (92%)		
Marital status			0.79	0.74
Single	39 (78%)	16 (32%)		
Married	11 (22%)	34 (78%)		
Job title			1.37	0.55
Staff nurse	44 (88%)	40 (80%)		
Head nurse	6 (12%)	10 (20%)		
Mean experience	6.02 ± 3.0	5.71 ± 3.38	1.66	0.23
5 years or less	27 (54%)	28 (56%)	5.57	0.08
More than 5 years	23 (46%)	22 (44%)		
Department			2.21	0.28
General ward	27 (54%)	22 (44%)		
ICU/ER	16 (32%)	16 (32%)		
Others	7 (14%)	12 (24%)		
Number of overtime hours last month			0.61	0.65
Half an hour or less	10 (20%)	17 (34%)		
1 hour or less	17 (34%)	14 (28%)		
1.5 hours or less	12 (24%)	10 (20%)		
More than 2 hours	12 (22%)	9 (18%)		
Shift type			1.84	0.40
8 hours	38 (76%)	32 (64%)		
12 hours	12 (24%)	18 (36%)		
Turnover intention	6.21 ± 1.80	6.09 ± 2.41	0.59	0.49
Total burnout score	55.10 ± 9.88	50.47 ± 11.38	1.01	0.56
Patient-related burnout	52.08 ± 10.71	45.03 ± 13.70	3.76	0.09
Personal burnout	54.87 ± 11.13	49.19 ± 12.28	0.39	0.77
Job-related burnout	52.46 ± 10.27	50.00 ± 11.41	0.36	0.76
Job stress	3.48 ± 0.51	3.42 ± 0.51	0.73	0.65
Stress response	2.05 ± 0.59	1.70 ± 0.69	2.68	0.22
Coping strategy	2.23 ± 0.18	2.22 ± 0.28	2.88	0.20

Table 2: Burnout dimensions and secondary outcomes between groups

Variables	Difference between pre- and post-test	F	P
Patient-related burnout			
Group A	19.3 ± 22.1	7.68	0.001
Group B	8.1 ± 19.7	15.81	<0.0001
Personal burnout			
Group A	21.5 ± 20.4	10.89	<0.0001
Group B	8.2 ± 19.3	17.70	<0.0001
Job-related burnout			

Group A	14.4 ± 21.1	2.58	0.080
Group B	7.1 ± 19.5	11.73	<0.0001
Job stress			
Group A	0.38 ± 0.80	1.27	0.31
Group B	0.40 ± 0.61		
Stress response			
Group A	0.32 ± 1.02	3.11	0.020
Group B	0.53 ± 0.66		
Coping strategy			
Group A	-0.10 ± 0.29	0.90	0.439
Group B	0.08 ± 0.33		

Discussion

This study was conducted to evaluate the outcomes of AI-assisted programs for the mitigation of nurses' burnout. The results showed a significant reduction in personal and patient-related burnout with the help of interventions performed with the help of AI. Towey-swift et al and Prudenzi et al found that since patient-related burnout was related to nurses' awareness of emotions, acceptance and commitment therapy was effective in self-reflection (7, 8). Previous studies have also verified that awareness and performance of these interventions help manage stress and reduce burnout (9, 10).

Work-related burnout was reduced with the help of AI interventions, but this difference over time was only significant in comparison with the control group. Brouwer et al. also reported that mindfulness therapy did not impact burnout scores for nurses directly involved in acute care of patients.¹¹ Hung et al and Bakker et al studied the effectiveness of burnout management intervention in nurses, concluding that it was successful in reducing burnout in less burdened workers, who rarely worked overtime (12, 13).

Work-related burnout is linked to workload, which can be managed by changing hospital policies and work-friendly space rather than occasional therapy (14). In comparison to developed countries, Pakistan has a high patient-to-bed ratio for nurses, putting excessive burden and strain (15). This is alarming and highlights the immediate need to strategize to improve nurses' work conditions.

Interventions were effective with and without AI in reducing job stress. Green and Kinchen reported contradictory results of mindfulness meditation, which were insignificant for job stress (16). Stress response also improved in both groups with better scores in the control group, which is similar to Delevry and Le (17).

Conclusion

AI-assisted interventions significantly reduce burnout in nurses, especially on a personal and patient level.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-24)

Consent for publication

Approved

Funding

Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

AN (Charge Nurse)

Conception of Study, Development of Research Methodology Design Study Design, manuscript review, and critical input.

QUN (Principal)

Manuscript drafting, Study Design,

YT (Assistant Nursing instructor)

Review of Literature, Data entry, Data analysis, and article drafting.

ST (Nursing Instructor)

critical input, Final Approval of the study

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

References

- Ge MW, Hu FH, Jia YJ, Tang W, et al. Global prevalence of nursing burnout syndrome and temporal trends for the last 10 years: a meta-analysis of 94 studies covering over 30 countries. *J Clin Nurs*. 2023;32(17–18):5836–54. <https://doi.org/10.1111/jocn.16708>
- Andlib S, Inayat S, Azhar K, Aziz F. Burnout and psychological distress among Pakistani nurses providing care to COVID-19 patients: a cross-sectional study. *Int Nurs Rev*. 2022;69(4):529–37. <https://doi.org/10.1111/inr.12750>
- Barrett K, Stewart I. A preliminary comparison of the efficacy of online Acceptance and Commitment Therapy (ACT) and Cognitive Behavioural Therapy (CBT) stress management interventions for social and healthcare workers. *Health Soc Care Community*. 2021;29(1):113–26. <https://doi.org/10.1111/hsc.13074>
- Jun J, Siegrist K, Weinshenker D. Evaluation of nurses' experiences with digital storytelling workshop: new way to engage, connect, and empower. *J Nurs Manag*. 2022;30(5):1317–23. <https://doi.org/10.1111/jonm.13619>
- von Gerich H, Moen H, Block LJ, Chu CH, et al. Artificial intelligence-based technologies in nursing: a scoping literature review of the evidence. *Int J Nurs Stud*. 2022;127:104153. <https://doi.org/10.1016/j.ijnurstu.2021.104153>
- Kim J, Choi I, Li Q. Customer satisfaction of recommender system: examining accuracy and diversity in several types of recommendation approaches. *Sustainability*. 2021;13(11):6165. <https://doi.org/10.3390/su13116165>
- Towey-Swift KD, Lauvud C, Whittington R. Acceptance and Commitment Therapy (ACT) for professional staff burnout: a systematic review and narrative synthesis of controlled trials. *J Ment Health*. 2023;32(2):452–64. <https://doi.org/10.1080/09638237.2021.2022628>
- Prudenzi A, Graham CD, Flaxman PE, Wilding S, et al. A workplace Acceptance and Commitment Therapy (ACT) intervention for improving healthcare staff psychological distress: a randomised controlled trial. *PLoS One*. 2022;17(4):e0266357. <https://doi.org/10.1371/journal.pone.0266357>
- Geuens N, Franck E, Vlerick P, Van Bogaert P. The effect of an online individualized program to prevent nurse burnout: a mixed method study. *Int J Workplace Health Manag*. 2022;15(1):19–37. <https://doi.org/10.1108/IJWHM-06-2020-0090>
- Lu F, Xu Y, Yu Y, Zhao R, et al. Long-term effects of a tailored

mindfulness-based program for Chinese intensive care unit nurses: a randomized parallel-group trial. *Nurse Educ Pract.* 2023;70:103640. <https://doi.org/10.1016/j.nepr.2023.103640>

11. Brouwer KR, Melander S, Walmsley LA, Norton J, et al. A mindfulness-based intervention for acute care nursing staff: a pilot study. *J Holist Nurs.* 2024;42(1):24–33. <https://doi.org/10.1177/08980101231181004>

12. Hung C-L, Lin Y-L, Chou C-M, Wang C-J. Efficacy of aromatherapy at relieving the work-related stress of nursing staff from various hospital departments during COVID-19. *Healthcare (Basel).* 2023;11(2):157. <https://doi.org/10.3390/healthcare11020157>

13. Bakker EJM, Kox JH, Boot CR, Francke AL, et al. Improving mental health of student and novice nurses to prevent dropout: a systematic review. *J Adv Nurs.* 2020;76(10):2494–509. <https://doi.org/10.1111/jan.14453>

14. Marković S, Kostić O, Terzić-Supić Z, Tomic Mihajlovic S, et al. Exposure to stress and burnout syndrome in healthcare workers, expert workers, professional associates, and associates in social service institutions. *Medicina (Kaunas).* 2024;60(3):499. <https://doi.org/10.3390/medicina60030499>

15. Hamza A, Zahoor H, Kouser S, Riaz MS, et al. The effects of nurse-to-patient ratios on quality of patient care in healthcare settings of Bahawalpur. 2025. (Preprint/Repository). <https://doi.org/10.5281/zenodo.15461454>

16. Green AA, Kinchen EV. The effects of mindfulness meditation on stress and burnout in nurses. *J Holist Nurs.* 2021;39(4):356–68. <https://doi.org/10.1177/08980101211015818>

17. Delevry D, Le QA. Effect of treatment preference in randomized controlled trials: systematic review of the literature and meta-analysis. *Patient.* 2019;12(6):593–609. <https://doi.org/10.1007/s40271-019-00379-6>



Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, <http://creativecommons.org/licenses/by/4.0/>. © The Author(s) 2025