

Personalized AI for workplace health promotion: performance management and healthcare worker engagement through digital analytics - Frontiers

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Executive Summary

This scoping review systematically maps peer-reviewed evidence on AI-based digital technologies used for workplace health promotion and performance management among healthcare workers, published between 2015 and July 2025. The authors argue that AI tools — spanning machine learning, natural language processing, chatbots, wearables, and predictive analytics — show measurable promise across two primary domains: AI-enabled health monitoring and intervention, and AI-driven performance optimization. From an initial pool of 351 records, 21 studies met full eligibility criteria under the PRISMA-ScR and PCC frameworks. Reported individual-level benefits included reductions in stress, burnout, anxiety, and musculoskeletal pain, while organizational-level benefits included improvements in workflow efficiency, documentation quality, leadership support, and staff engagement. However, the review explicitly identifies significant limitations: short study durations, methodological heterogeneity across included studies, privacy and ethical concerns, and variable rates of staff adoption. The authors conclude that while AI-based tools hold potential for enhancing both worker health and organizational sustainability in healthcare settings, long-term effectiveness remains unestablished, and rigorous, human-centered, and privacy-conscious research designs are needed before broader conclusions can be drawn.

Key Insights

1. Two dominant application domains emerged across 21 included studies: AI-enabled health monitoring and intervention (targeting stress, burnout, mental health, and musculoskeletal outcomes) and AI-driven performance optimization (targeting workflow efficiency, documentation, and operational metrics).
2. Despite broadly positive reported outcomes, the evidence base is characterized by short study durations, heterogeneous methodologies, and inconsistent outcome measurement tools, making cross-study comparisons and generalization unreliable.
3. Privacy, data security, lack of transparency, and ethical concerns consistently appeared as adoption barriers, while personalization capability, efficiency gains, and improved accuracy were identified as key enablers of AI tool uptake among healthcare workers.

Practical Takeaways

- Organizations deploying AI-based health promotion or performance management tools in healthcare settings encounter variable adoption rates, suggesting that trust-building, staff education, and

governance structures are material factors in implementation outcomes.

- The intersection of individual wellbeing outcomes and organizational performance metrics in AI-enabled systems points toward an emerging integrated model of workforce management in healthcare, though the evidence for long-term impact across both dimensions remains limited.

Frameworks Mentioned

PRISMA-ScR — PRISMA Extension for Scoping Reviews — a reporting guideline used to structure and document the scoping review methodology and study selection process.

PCC Framework — Population–Concept–Context framework recommended by the Joanna Briggs Institute for formulating eligibility criteria in scoping reviews, used here to define healthcare workers, AI-based digital technologies, and formal healthcare settings.

Critical Analysis

Strengths: The review follows established methodological standards (PRISMA-ScR, Arksey and O'Malley, JBI refinements), uses six electronic databases including gray literature sources, employs dual independent reviewers with consensus resolution, and is transparent about exclusion reasons. The authors are notably candid about limitations, explicitly flagging short study durations, methodological heterogeneity, and the absence of long-term outcome data. The multidisciplinary framing across occupational health, digital health, organizational behavior, and health informatics adds breadth.

Limitations: The final sample of 21 studies is small for a field scoping review, limiting the generalizability of thematic patterns. The heterogeneity of AI technologies, study designs, and outcome measures makes synthesis inherently approximate. Several included studies rely on self-reported or survey-based data, introducing social desirability bias. The review covers only English-language publications, creating a language bias. No gray literature was ultimately included despite being searched, which may underrepresent practitioner-led implementations. The article text contains a minor internal inconsistency — the abstract states 21 studies were included, while the results section references '23 studies' in one passage — which reduces editorial confidence. No formal quality appraisal of included studies is described, which is consistent with scoping review norms but limits conclusions about evidence strength.

Organizational Practice

Healthcare organizations in the included studies deployed AI tools including machine learning-based burnout prediction, autonomous clinical voice assistants, chatbots for musculoskeletal health adherence, AI-driven operations management systems, deep learning emotion recognition for HR management, AI-based documentation systems to reduce administrative burden, hand hygiene monitoring, and clinical decision support systems. These tools were integrated into hospitals, clinics, and health systems, targeting both clinical staff (nurses, physicians, residents) and non-clinical staff (administrators, informaticists). Adoption was facilitated by personalization, efficiency, and accuracy but impeded by privacy concerns, lack of transparency, and insufficient governance structures.

Strategic Implications

The convergence of health monitoring and performance optimization functions within single AI-enabled systems signals a trend toward integrated workforce management platforms in healthcare, where individual wellbeing data and organizational productivity metrics are increasingly co-managed. The identified barriers — privacy, ethical concerns, and low transparency — indicate that regulatory and

governance frameworks will be a determining factor in the pace and depth of AI adoption in healthcare PMS contexts. The short study durations across the evidence base suggest the field is still in early-stage evaluation, meaning claims about sustained performance or health improvements remain empirically unverified. The variability in AI technology types and outcome measures points toward a fragmented vendor and research landscape without yet-established standards for measuring AI-driven PMS effectiveness in healthcare.

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