

Cost-effectiveness of Artificial Intelligence Interventions for Musculoskeletal Disorders: Systematic Review

Gebrye T¹, Mbada C¹, Niyi-Odumosu F.A³, Fatoye C¹, Odetunde M⁵, Hakimi Z⁴, Useh U², Fatoye F^{1, 2}

EE236

¹Department of Health Professions, Manchester Metropolitan University, Manchester, United Kingdom; ²Lifestyle Diseases, Faculty of Health Sciences, North–West University, South Africa; ³School of Applied Sciences, University of the West of England, Bristol, United Kingdom; ⁴Sobi AB, Stockholm, Sweden; ⁵Department of Medical Rehabilitation, College of Health Sciences, Obafemi Awolowo University, Ile-Ife, Nigeria

Introduction

- Musculoskeletal disorders (MSDs) are a leading cause of disability and health expenditure globally.
- Artificial intelligence (AI) technologies such as machine learning, computer vision, and wearable sensors are increasingly used in MSD diagnosis, monitoring, and management.
- While AI shows promise in improving outcomes and efficiency, evidence on cost-effectiveness remains scarce.

Purpose

- To systematically review and synthesize evidence on the cost-effectiveness of AI-based interventions in the prevention, diagnosis, treatment, and management of MSDs.

Methods

- Design: Systematic review following PRISMA guidelines.
- Data sources: PubMed, Medline, CINAHL, Cochrane CENTRAL, and Web of Science.
- Search period: Inception to 6th April 2025.
- Inclusion criteria:
 - Studies evaluating AI-powered interventions for MSDs.
 - Studies reporting cost, resource use, or cost-effectiveness outcomes.
- Data extraction: Resource use, costs, cost-effectiveness ratios, sample characteristics, and study design.
- Quality assessment: Quality of Health Economic Studies (QHEs) instrument.

Results

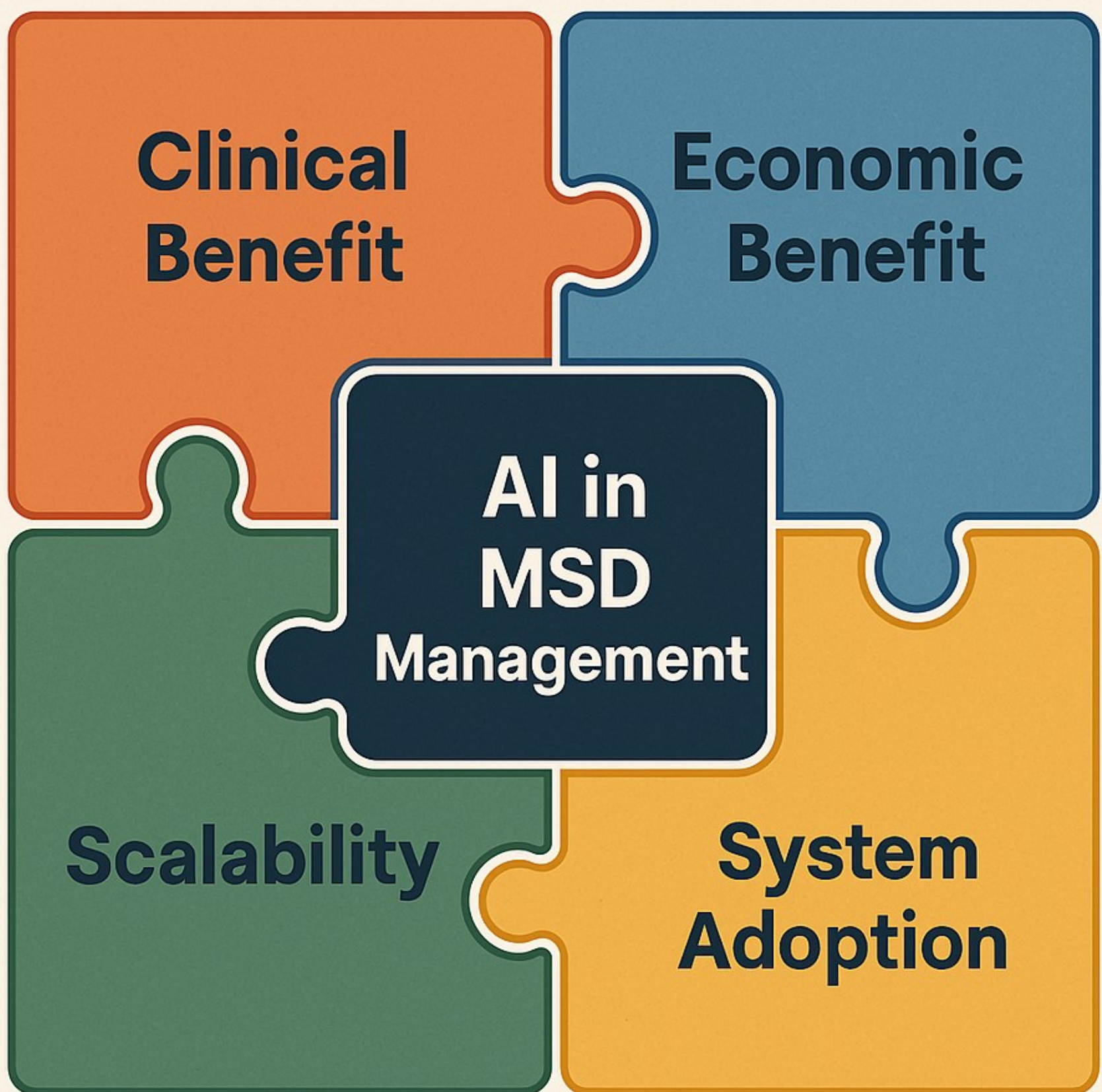
- Studies included: 5 (from USA, Germany, Denmark, Australia, South Korea).
- Perspectives used: Healthcare (n=3), Societal (n=1), Combined (n=1)
- AI interventions identified:
 - Deep learning–based diagnostic & exercise platform
 - Self-BACK mobile app
 - Standardized MRI protocols
 - Back Pain Choices online decision tool
 - Kaia back pain app
- Time horizons: 4 weeks to 3 years.
- Economic outcomes: AI interventions consistently demonstrated cost savings and improved clinical outcomes.
- QHEs scores: High methodological quality (mean = 90.2%).

Conclusion

- AI interventions for MSDs demonstrated both clinical and economic benefits.
- Findings support the integration of AI technologies in MSD management pathways.
- Further research should focus on long-term cost outcomes, scalability, and healthcare system adoption.

References

- Hartvigsen J, Hancock MJ, Kongsted A, Louw Q, Ferreira ML, Genevay S, Hoy D, Karppinen J, Pransky G, Sieper J, Smeets RJ. What low back pain is and why we need to pay attention. The Lancet. 2018 Jun 9;391(10137):2356-67.
- Topol EJ. High-performance medicine: the convergence of human and artificial intelligence. Nature medicine. 2019 Jan;25(1):44-56.



Contact:

Professor Francis Fatoye BSc, MSc (SportMed), MSc, PhD, MBA
Department of Health Professions
Manchester Metropolitan University, M15 6GX, UK
Email: f.fatoye@mmu.ac.uk