THE FIRST INTERNATIONAL CONGRESS ON HEALTH SERVICES TRANSFORMATION
اولین کنگره بین المللی تحول خدمات سلامت
۲۸ و ۲۷ مهر ماه
ISC 05251-58426 Scopus CIVILICA



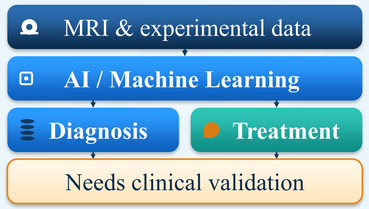
Artificial Intelligence from Diagnosis to Treatment of Disease: Spinal Imaging, Biomaterials, and Drug Delivery in Biomedical Engineering

Javid Mirzaei (1), Mitra Vahed Pirkoohi (2)

(1) Independent Researcher in Biomedical Engineering, Tehran, Iran

(2) Medical Equipment Unit, Astaneh-ye Ashrafiyeh Health Network, Gilan, Iran

Code: 1500



Graphical Abstract

Backgrounds

Intervertebral disc degeneration is a major cause of chronic low back pain. MRI is widely used for diagnosis, but manual interpretation is slow and error-prone. Deep learning has been applied to automate disc segmentation and grading, and machine learning to speed up the design of bone scaffolds and nanofibers and to predict nanocarrier toxicity.

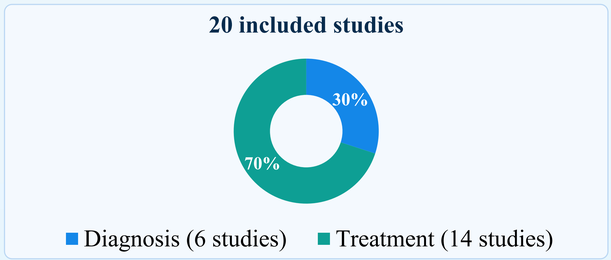
Methods

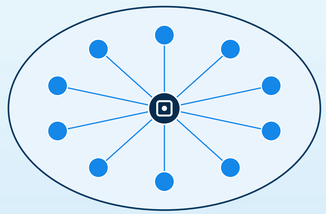
Narrative (non-systematic) review of PubMed, Jan–Jun 2026. From about 40 candidates, 20 open-access primary studies on diagnostic imaging or treatment design were selected. No formal risk-of-bias tool was applied.



Findings

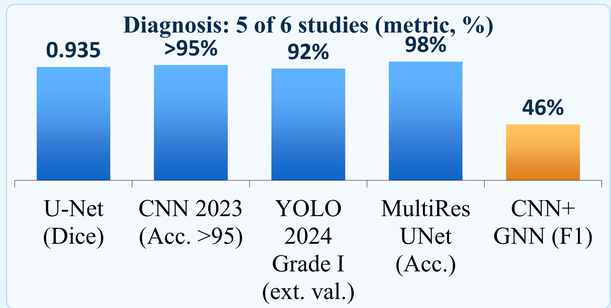
Twenty studies: six on imaging-based diagnosis and fourteen on treatment design.

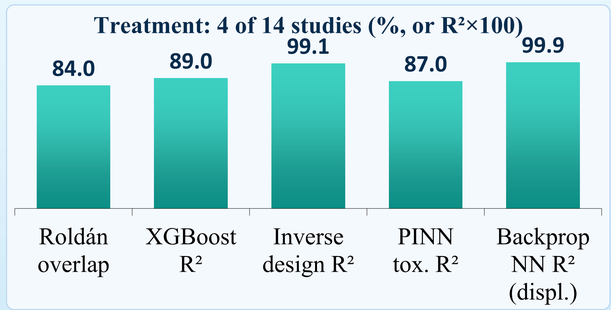




AI models learn patterns from MRI & experimental data

U-Net segmentation reached a Dice coefficient of 0.935 (n=43) [1]. External validation was reported in only 1 of 6 diagnostic studies [2].





Nanocarrier toxicity was predicted with mean R^2=0.87 [5]. Validation was almost entirely computational or in vitro; only 1 of 14 treatment studies tested a design in a living organism (rodent).

Conclusion

AI plays a growing, complementary role from diagnosis to treatment.

Diagnostic tools rely mainly on MRI-based deep learning; treatment tools draw on a broader mix of classical and deep-learning methods. Clinical validation in human patients remains limited.

Diagnostic AI
MRI deep learning

Treatment AI
Broader methods

Only 1 of 14 treatment studies tested in vivo

References

1. Markhali MI, et al. Neural network segmentation of disc volume from magnetic resonance images and the effect of degeneration and spinal level. JOR Spine. 2024;7:e70000.
2. Liawrungrueang W, et al. Artificial intelligence classification for detecting and grading lumbar intervertebral disc degeneration. Spine Surg Relat Res. 2024;8(6):552-559.
3. Rahdar A, Fathi-Karkan S. A physics-informed machine learning framework for predicting and mitigating doxorubicin nanocarrier toxicity in normal cells. Sci Rep. 2026;16:10837.