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Artificial Intelligence in Detecting Ventilator Asynchrony: A New Clinical Window for Physical Therapy Intervention: Narrative Review

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Introduction

Ventilator asynchrony is a frequent yet under-recognized problem in mechanically ventilated patients. Failure to detect asynchrony early may lead to prolonged ventilation, respiratory muscle weakness, and delayed rehabilitation. Recent advances in artificial intelligence have introduced smart camera and waveform-based systems capable of detecting subtle asynchrony patterns in real time Artificial Intelligence and Smart Monitoring Systems.

AI-based systems, particularly convolutional neural networks, analyze ventilator waveforms and patient motion patterns with minimal human input. These systems demonstrate superior accuracy compared to traditional bedside observation and provide continuous monitoring without increasing clinical workload.

From Detection to Action: The Physical Therapist's Perspective Detection of ventilator asynchrony should be considered a clinical alert, not merely a technical finding.

Physical therapists are uniquely positioned to respond through:

Adjustment of patient positioning.

Respiratory facilitation techniques.

Breathing pattern retraining.

Optimization of chest wall mobility.

Early intervention following AI alerts may prevent progression to ventilator-induced diaphragm dysfunction.

Clinical Integration in the ICU

AI-based monitoring should be integrated into multidisciplinary ICU care. Collaboration between intensivists and physical therapists ensures that detected asynchrony results in immediate therapeutic action rather than delayed recognition.

Future Directions

Future research should explore structured protocols linking AI-detected asynchrony with standardized physical therapy interventions and functional outcomes.

Conclusion

Artificial intelligence provides early and accurate detection of ventilator asynchrony, while physical therapy interventions translate this information into meaningful clinical improvement. Together, they represent a powerful model for modern critical care rehabilitation.