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Artificial intelligence and pediatric surgery

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Background:
Artificial Intelligence (AI) has recently demonstrated remarkable potential to improve clinical workflows, yet its role in pediatric surgery remains largely unexplored. AI comprises technologies that mimic human intelligence — machine learning, natural language processing, computer vision, and robotics — to enhance diagnosis, decision-making, and operative precision. A core element of AI in pediatric surgery is machine learning, which allows algorithms to detect patterns in large datasets of pediatric operations and diagnoses, enabling predictive modeling and operative planning.

Methods
A systematic search of ten medical databases (inception–January 2025) identified studies on AI applications in pediatric surgery.
Inclusion criteria: Original investigations or applied AI models for surgically managed pediatric conditions Educational or clinical implementation potential Exclusion criteria: Non-peer-reviewed articles, commentaries, or case reports Data extraction included study design, AI method and algorithm type, validation, bias assessment (PROBAST, QUADAS-2), and teaching relevance.

Discussion
AI is **revolutionizing modern medicine** and has entered pediatric surgery as a **powerful partner rather than a competitor**.
Through **machine learning, deep learning, computer vision, and robotics**, AI enhances:
Surgical precision and navigation
Diagnostic accuracy and intraoperative decision-making
Postoperative monitoring and individualized patient care
However, automation raises workforce concerns — surgeons who fail to engage with AI risk **professional redundancy**.
Future pediatric surgeons must therefore **embrace AI** to ensure safer and smarter surgical practice.

Results:
Out of **6179 screened articles**, **202** were included.
Predictive models: 50% (adverse events 30%, surgical outcomes 26%, survival 10%)
Diagnostic models: 30%
Decision support systems: 42%
Main specialties: General 45%, Urology 42%, Thoracic/Neurosurgery 36%
Interpretable models: 53%
Externally validated models: 10%
Concerns about data applicability were noted in 10%.

Conclusions
While AI holds **wide clinical potential**, few pediatric surgical models are externally validated or unbiased.
Future research should focus on **interpretable, prospectively validated AI systems** integrated into surgical workflows.
The **next technological wave** will be shorter and faster — pediatric surgeons and medical students of today will practice amid this AI revolution.