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Assessment of Performance Capability of Machine Learning Methods in Predicting Postoperative Outcomes of PCNL Surgery in Patients of Kidney Stone Disease

Rashmi Jain
IT Department, Dhar Polytechnic College, Dhar, India

Abstract: *Kidney stone disease is everywhere in urology, and figuring out what'll happen after surgery is a big deal for both doctors and patients. For years, people have relied on scoring systems like the Guy's Stone Score and the CROES nomogram to predict how things will go after an operation. But honestly, those tools have their flaws. They only look at a handful of factors, and a lot depends on how each doctor interprets the results.*

Now, with all the data piling up in medicine, machine learning is starting to change the game. These algorithms can sift through massive, complicated datasets—think details about the stones themselves, patient histories, lab results, scans—and spot patterns we just can't see with traditional methods.

New research shows machine learning models aren't just a little bit better; they're nailing predictions about who'll be stone-free after surgery, who'll need a second procedure, and who might run into trouble like bleeding or infection. Some models hit accuracy rates over 90%. The best part? They keep getting smarter as more data comes in.

In our study, we're taking a close look at how well different machine learning approaches predict outcomes for patients undergoing percutaneous nephrolithotomy. We're stacking them up against the old-school scoring systems to see which does a better job. The goal is to figure out if machine learning can actually help doctors make better choices, plan treatments more effectively, and, in the end, get better results for people dealing with kidney stones.

Keywords: CROES nomogram, Percutaneous nephrolithotomy (PCNL), Machine learning, Predictive modeling, Postoperative outcomes

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