

Study uses machine learning to predict opioid use disorder treatment interruptions

May 16 2024, by Tyler Francischine



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University of Florida researchers have developed a system designed to identify patients at high risk of discontinuing buprenorphine treatment for opioid use disorder.

An FDA-approved prescription drug, buprenorphine is one of three commercially available treatments for [opioid use disorder](#) proven to be effective in treating both pain and addiction.

In a study [published](#) in the journal *Computers in Biology and Medicine*, Md Mahmudul Hasan, Ph.D., and his research team found that roughly 15% of patients did not complete the clinically recommended yearlong buprenorphine treatment, while about 46% of patients stopped treatment within the first three months. With the help of artificial intelligence, or AI, the team also identified [high-risk patients](#) and several factors associated with treatment discontinuation.

Hasan, an assistant professor in the UF College of Pharmacy department of pharmaceutical outcomes and policy with a joint appointment in the UF Warrington College of Business department of information systems and operations management, said the [retrospective study](#), which included insured individuals aged 18 to 64 who were prescribed buprenorphine to treat opioid use disorder, offers new insights to use in the fight against the national public health epidemic that claimed more than 80,000 lives in the United States in 2021.

The study measured gaps of 30 days or more when buprenorphine prescriptions weren't filled within the first year of treatment. By building predictive models focusing on distinct treatment stages—the time of treatment initiation, one month and three months following the start of treatment—Hasan's team found that nearly 15% of patients discontinued treatment prematurely. The team noted this is a conservative estimate, as several patient exclusion criteria might have resulted in a lower discontinuation rate.

"We know that sticking with a buprenorphine treatment plan is beneficial. Premature discontinuation could increase the risk of hospitalization, [drug overdose](#) and most importantly, mortality," Hasan

said.

"If we can use AI to predict which patients are at a higher risk of this behavior, clinical practitioners can get to the root cause, make more informed decisions and design more targeted interventions for those patients."

Hasan's team used a framework for machine learning prediction and risk stratification to help identify high-risk patients and determine which factors contribute to a lack of buprenorphine treatment compliance.

Risk factors identified in this study include age, gender, early treatment adherence, use of stimulants or antipsychotics and the number of days' supply associated with the first buprenorphine prescription that a patient receives. The study also found that living in rural areas and other treatment access barriers contribute to a higher risk of discontinuation.

"Younger patients are at a higher risk of prematurely stopping treatment, along with those with a history of stimulant use, including nicotine," Hasan said. "We also found patients with lower buprenorphine adherence at the early treatment stage are more at risk of premature treatment discontinuation."

Hasan said when the technology developed in the study is available to medical centers across the country, it will save frontline clinicians precious time while giving patients more access to [buprenorphine treatment](#).

"Primary care physicians are already overburdened and overworked, and they have limited resources. A tool like this that can reliably predict which patient will be high-risk could be helpful," Hasan said. "Within a short time and without increasing their workload, health care providers can identify the interventions needed for each patient, allowing them to

best allocate their limited resources."

UF graduate student Javed Al Faysal was the study's lead author.

More information: Javed Al Faysal et al, An Explainable Machine Learning Framework for Predicting the Risk of Buprenorphine Treatment Discontinuation for Opioid Use Disorder among Commercially Insured Individuals, *Computers in Biology and Medicine* (2024). [DOI: 10.1016/j.combiomed.2024.108493](https://doi.org/10.1016/j.combiomed.2024.108493)

Provided by University of Florida

Citation: Study uses machine learning to predict opioid use disorder treatment interruptions (2024, May 16) retrieved 26 June 2024 from <https://medicalxpress.com/news/2024-05-machine-opioid-disorder-treatment.html>

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