

Researchers use AI to predict antidepressant outcomes in youth

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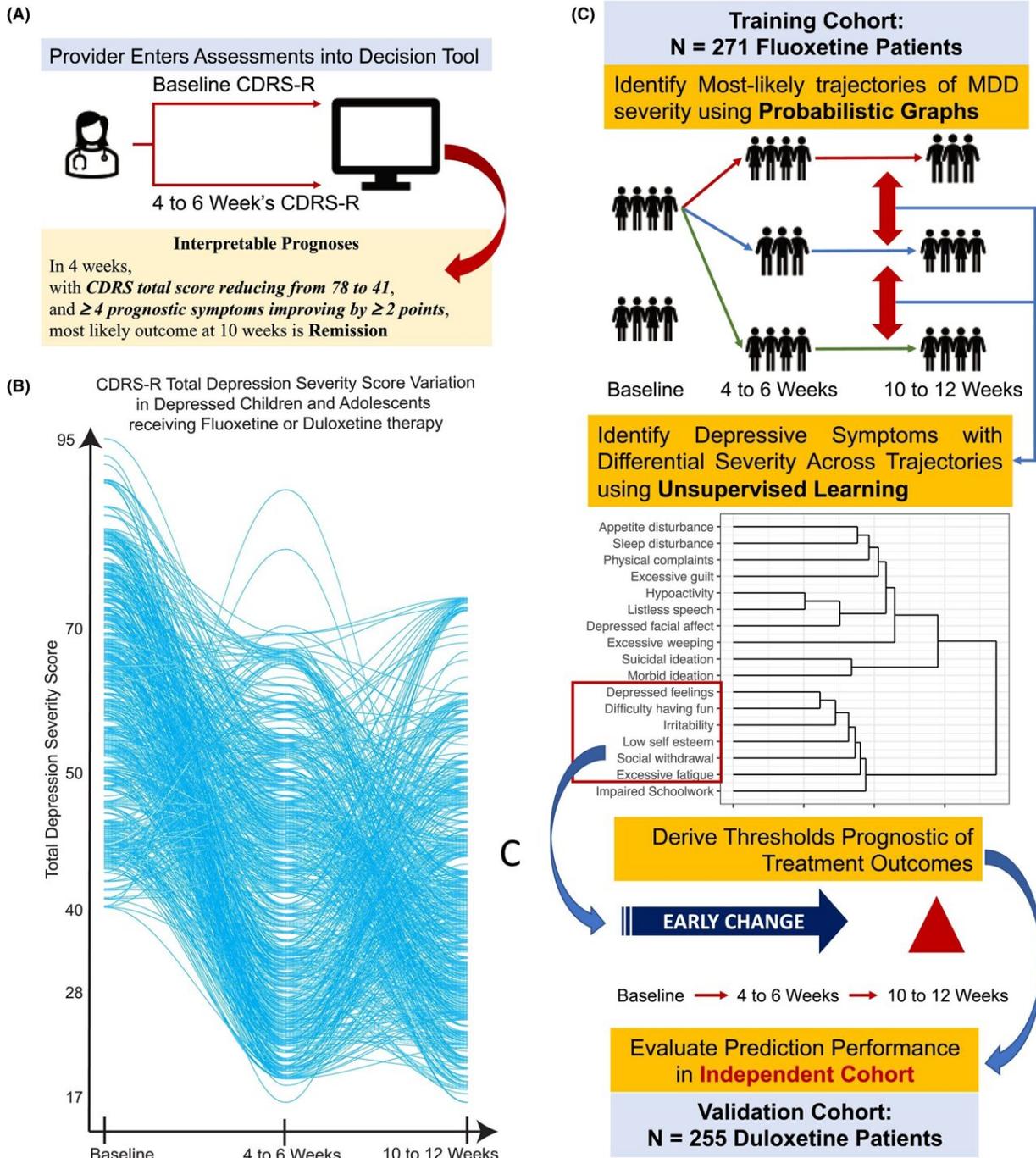


Figure 1. (A) Envisioned use of proposed probabilistic graph-based tool to derive prognoses of treatment outcomes in children and adolescents treated with fluoxetine or duloxetine. (B) Trajectories of Children’s Depression Rating Scale-Revised (CDRS-R) total score in patients treated with fluoxetine. (C) The

machine learning workflow. Credit: *Journal of Child Psychology and Psychiatry* (2022). DOI: 10.1111/jcpp.13580

Mayo Clinic researchers have taken the first step in using artificial intelligence (AI) to predict early outcomes with antidepressants in children and adolescents with major depressive disorder, in a study published in *The Journal of Child Psychology and Psychiatry*. This work resulted from a collaborative effort between the departments of Molecular Pharmacology and Experimental Therapeutics, and Psychiatry and Psychology, at Mayo Clinic, with support from Mayo Clinic's Center for Individualized Medicine.

"This preliminary work suggests that AI has promise for assisting clinical decisions by informing physicians on the selection, use and dosing of antidepressants for children and adolescents with [major depressive disorder](#)," says Paul Croarkin, D.O., a Mayo Clinic psychiatrist and senior author of the study. "We saw improved predictions of treatment outcomes in samples of children and adolescents across two classes of antidepressants."

In the study, researchers identified variation in six [depressive symptoms](#): difficulty having fun, social withdrawal, excessive fatigue, irritability, [low self-esteem](#) and depressed feelings.

They assessed these symptoms with the [Children's Depression Rating Scale-Revised](#) to predict outcomes to 10 to 12 weeks of antidepressant pharmacotherapy:

- The six symptoms predicted 10- to 12-week outcomes at four to six weeks in fluoxetine testing datasets, with an average accuracy of 73%.

- The same six symptoms predicted 10- to 12-week outcomes at four to six weeks in duloxetine testing datasets, with an average accuracy of 76%.
- In placebo-treated patients, predicting response and remission accuracy was significantly lower than for antidepressants at 67%.

These outcomes show the potential of AI and [patient data](#) to ensure children and adolescents receive treatment that has the highest likelihood of delivering therapeutic benefits with minimized side effects, explains Arjun Athreya, Ph.D., a Mayo Clinic researcher and lead author of the study.

"We designed the algorithm to mimic a clinician's logic of treatment management at an interim time point based on their estimated guess of whether a patient will likely or not benefit from pharmacotherapy at the current dose," says Dr. Athreya. "Hence, it was essential for me as a computer engineer to embed and observe the practice closely to not only understand the needs of the patient, but also how AI can be consumed and useful to the clinician to benefit the patient."

Next steps

The research findings are a foundation for future work incorporating physiological information, brain-based measures and pharmacogenomic data for precision medicine approaches in treating youth with depression. This will improve the care of young patients with depression, and help clinicians initiate and dose antidepressants in patients who benefit most.

"Technological advances are understudied tools that could enhance treatment approaches," says Liewei Wang, M.D., Ph.D., the Bernard and Edith Waterman Director of the Pharmacogenomics Program and Director of the Center for Individualized Medicine at the Mayo Clinic.

"Predicting outcomes in [children](#) and adolescents treated for depression is critical in managing what could become a lifelong disease burden."

More information: Arjun P. Athreya et al, Evidence for machine learning guided early prediction of acute outcomes in the treatment of depressed children and adolescents with antidepressants, *Journal of Child Psychology and Psychiatry* (2022). [DOI: 10.1111/jcpp.13580](https://doi.org/10.1111/jcpp.13580)

Provided by Mayo Clinic

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