Adolescent, parent, and provider attitudes toward a machine learning based clinical decision support system for selecting treatment for youth depression

Meredith Gunlicks-Stoessel[1], Yangchenchen Liu[2], Catherine Parkhill[1], Nicole Morrell[3],

Mimi Choy-Brown[4], Christopher Mehus[3,5], Joel Hetler[5], and Gerald August[5]

[1]Department of Psychiatry & Behavioral Sciences, University of Minnesota, 2025 E River Parkway, 55414 Minneapolis, MN, USA

[2]Department of Psychology, University of Minnesota, Minneapolis, MN, USA

[3]Center for Applied Research and Educational Improvement, University of Minnesota, St. Paul, MN, USA

[4]School of Social Work, University of Minnesota, St. Paul, MN, USA

[5]Department of Family Social Science, University of Minnesota, St. Paul, MN, USA

Author Note

Abstract

Background: Machine learning based clinical decision support systems (CDSSs) have been proposed as a means of advancing personalized treatment planning for disorders, such as depression, that have a multifaceted etiology, course, and symptom profile. However, machine learning based models for treatment selection are rare in the field of psychiatry. They have also not yet been translated for use in clinical practice. Understanding key stakeholder attitudes toward machine learning based CDSSs is critical for developing plans for their implementation that promote uptake by both providers and families. Methods: In Study 1, a prototype machine learning based Clinical Decision Support System for Youth Depression (CDSS-YD) was demonstrated to focus groups of adolescents with a diagnosis of depression (n=9), parents (n=11), and behavioral health providers (n=8). Qualitative analysis was used to assess their attitudes towards the CDSS-YD. In Study 2, behavioral health providers were trained in the use of the CDSS-YD and they utilized the CDSS-YD in a clinical encounter with 6 adolescents and their parents as part of their treatment planning discussion. Following the appointment, providers, parents, and adolescents completed a survey about their attitudes regarding the use of the CDSS-YD. Results: All stakeholder groups viewed the CDSS-YD as an easy to understand and useful tool for making personalized treatment decisions, and families and providers were able to successfully use the CDSS-YD in clinical encounters. Parents and adolescents viewed their providers as having a critical role in the use the CDSS-YD, and this had implications for the perceived trustworthiness of the CDSS-YD. Providers reported that clinic productivity metrics would be the primary barrier to CDSS-YD implementation, with the creation of protected time for training, preparation, and use as a key facilitator. Conclusions: Machine learning based CDSSs, if proven effective, have the potential to be widely accepted tools for personalized treatment planning. Successful implementation will require addressing the system-level barrier of having sufficient time and energy to integrate it into practice.

Keywords: Clinical decision support systems, Depression, Adolescents, Health

care providers, Attitudes

Adolescent, parent, and provider attitudes toward a machine learning based clinical decision support system for selecting treatment for youth depression

Introduction

Depression among adolescents is becoming an increasingly critical public health concern. An estimated 4.1 million adolescents in the United States had at least one major depressive episode in 2020 (Substance Abuse and Mental Health Services Administration, 2021). This represents 17.0% of the population of 12–17 year-olds and is an increase from 11.3% in 2014 and 8.7% in 2005 (Mojtabai, Olfson, & Han, 2016; Substance Abuse and Mental Health Services Administration, 2021). The rise in prevalence is compounded by the fact that while treatment options exist, 30–50% of youth who receive an evidence-based treatment do not experience the intended reduction in symptoms (Mufson et al., 2004; Treatment for Adolescents With Depression Study (TADS) Team, 2004).

Method

Participants

Adolescents and parents/caregivers were recruited from a clinical trial of treatments for depression in adolescents conducted by the principal investigator. Families were contacted if they had provided consent to be contacted about future research opportunities. Nine adolescents (age range=13–16, mean age=15.11, SD=1.05) participated in the focus groups.

Materials and Procedure

A total of six focus groups were conducted: two with adolescents, two with parents, and two with providers. Semi-structured interview guides for each group were designed by the research team for this study and were guided by relevant constructs from the literature on CDSS implementation in other fields. The primary domains of interest were perspectives on (1) the acceptability and appropriateness of the CDSS-YD, (2) determinants of use of the CDSS-YD, and (3) potential impact on treatment processes.

Results

Key themes, subthemes, and exemplar quotations are displayed in Table 1. Five key themes were found: (1) providers, parents, and adolescents viewed the CDSSYD as helpful for treatment; (2) providers, parents, and adolescents differed in their views of the trustworthiness of the CDSS-YD, with adults having more trust in the data-driven approach of the CDSS-YD and adolescents having more trust in the provider's expertise; (3) parents and adolescents saw their providers as having a critical role in the use the CDSS-YD; (4) providers, parents, and adolescents expressed a desire to understand how the questionnaire responses informed the CDSS-YD's treatment recommendation; and (5) adolescents expressed discomfort with sharing their questionnaire results with the parents, and they expressed a desire for privacy when reviewing the CDSS-YD results with the provider.

Table 1

Key themes regarding provider, parent, and adolescent attitudes toward the CDSS-YD

Themes	Subthemes
Providers, parents, and adolescents viewed the CDSS-YD as helpful for treatment.	Providers, parents, and adolescents viewed the CDSS-YD as an informative and useful tool for personalized treatment planning.
	Providers, parents, and adolescents believed that use of the CDSS-YD could foster a stronger therapeutic relationship.
Providers, parents, and adolescents differed in their views of the trustworthiness of the CDSS-YD.	Providers and parents viewed the CDSS-YD as trustworthy because it is research-based and the treatment recommendation is data-driven.
	Use of the CDSS-YD increased parents' trust in the provider and their perception of provider expertise.

Table 1 (continued)

Themes	Subthemes
Parents and adolescents saw their providers as having a critical role in the use of the CDSS-YD.	Youth viewed the CDSS-YD treatment recommendation as less trustworthy than a provider recommendation.
	The provider's opinion of the CDSS-YD treatment recommendation was a facilitator of families' trust.
	It is important for the CDSS-YD to be used in the context of a discussion with the provider.
Providers, parents, and adolescents expressed a desire to understand how the questionnaire responses informed the CDSS-YD's treatment recommendation.	
Adolescents expressed discomfort with sharing their questionnaire results with the parents, and they expressed a desire for privacy when reviewing the CDSS-YD results with the provider.	

Discussion

The current feasibility studies collected multi-method feedback from adolescents, parents, and behavioral health providers on a computationally-based CDSS that guides personalized treatment planning for youth with depression. These studies provide support for the feasibility of the CDSS-YD, which is an important step toward future effectiveness studies. Overall, all stakeholder groups liked the CDSS-YD. They found it easy to understand and useful for making treatment decisions. This was true for

providers and families who viewed the CDSS-YD during a focus group, as well as for those who used it during a clinical encounter. They perceived the CDSS-YD to provide clarity and direction for engaging in treatment planning, which can otherwise often feel like an ambiguous or "trial and error" process. Providers reported liking that the CDSS-YD helped provide some structure to the treatment planning process and made it easy for them to explain the treatment recommendations to the family. Parents and providers particularly liked that the CDSS-YD was developed from research and that the treatment recommendation was based on objective data, as opposed to an opinion, which could be perceived as biased. Parents also reported that providers' use of the CDSS-YD would increase their perception of the providers' expertise because it would indicate they were knowledgeable about the most recent science. Of note, some of the negative beliefs and attitudes towards CDSSs that were identified in other studies were not identified regarding the CDSS-YD, including the belief that the use of CDSS would reduce providers' professional autonomy or interfere with the provider-patient therapeutic relationship. In fact, all stakeholder groups viewed the use of the CDSS-YD as a way of strengthening the therapeutic relationship.

References

Mojtabai, R., Olfson, M., & Han, B. (2016). National trends in the prevalence and treatment of depression in adolescents and young adults. , *138*(6), e20161878. doi: 10.1542/peds.2016-1878

Mufson, L., Dorta, K. P., Wickramaratne, P., Nomura, Y., Olfson, M., & Weissman, M. M. (2004). A randomized effectiveness trial of interpersonal psychotherapy for depressed adolescents. , *61*(6), 577–584. doi: 10.1001/archpsyc.61.6.577

Substance Abuse and Mental Health Services Administration. (2021). *Key substance use and mental health indicators in the united states: Results from the 2020 national survey on drug use and health* (No. PEP21-07-01-003). Retrieved from `https://www.samhsa.gov/data/`

Treatment for Adolescents With Depression Study (TADS) Team. (2004). Fluoxetine, cognitive-behavioral therapy, and their combination for adolescents with DepressionTreatment for adolescents with depression study (TADS) randomized controlled trial. , *292*(7), 807–820. Retrieved 2025-09-07, from `https://doi.org/10.1001/jama.292.7.807` doi: 10.1001/jama.292.7.807