Case report

PSYCHIATRY

Digital pathways to self-harm: Modafinil-induced mania and AI-assisted operationalization of suicidal intent in a law student: a case report

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Abstract

Background. Modafinil is a wakefulness-promoting (eugeroic) agent increasingly used off-label for cognitive enhancement. Although generally regarded as having a favorable psychiatric safety profile, it can precipitate manic or hypomanic episodes in vulnerable individuals, and the boundary between a self-limited substance-induced episode and the unmasking of an underlying mood disorder is not always clear at presentation.

Case Presentation. We report the case of a 20-year-old female law student admitted to the emergency unit after a suicide attempt by polypharmacy overdose during escalating off-label modafinil use. A notable feature was her use of an artificial intelligence (AI) conversational platform to inform about the preparation of the attempt: the AI did not generate her suicidal motivation but contributed to operationalizing an already-formed intent. The acute presentation was characterized by logorhoea, affective expansiveness, and behavioral disinhibition, initially consistent with a substance-induced manic episode. Over the three-month follow-up, however, subsyndromal hypomanic features persisted after discontinuation of modafinil and after withdrawal of a serotonergic antidepressant, while the patient was maintained on a mood stabilizer — raising the possibility that modafinil acted as a precipitant unmasking an underlying bipolar diathesis.

Conclusions. This case illustrates modafinil's potential to precipitate affective destabilization in a high-achieving young person under sustained academic pressure, and the difficulty of distinguishing a transient substance-induced episode from an emerging bipolar-spectrum disorder without longitudinal follow-up. It also highlights an emerging risk: the role of large language models (LLMs) in operationalizing — rather than originating — suicidal intent. The case underscores the need for careful psychiatric screening before prescribing wakefulness-promoting agents, for continued longitudinal monitoring, and for attention to patients' interactions with AI platforms during crisis assessment.

Keywords: Modafinil, substance-induced mania, bipolar diathesis, Artificial Intelligence (AI) ethics, Large Language Models (LLMs), suicide attempt, cognitive enhancement, off-label drug use, academic stress

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Introduction

Modafinil is a non-amphetamine wakefulness-promoting agent approved for narcolepsy, shift-work sleep disorder, and excessive daytime sleepiness associated with obstructive sleep apnea. Over the past two decades its use has expanded well beyond approved indications, particularly among students and professionals seeking enhanced concentration and prolonged wakefulness. This expansion has been facilitated by the widespread perception of modafinil as a comparatively safe alternative to classical psychostimulants, with a lower risk of addiction and psychiatric adverse effects [1,2,3].

From a neurobiological perspective, modafinil exerts a complex, multimodal action. Its primary effect is inhibition of the dopamine transporter, increasing extracellular dopamine in cortico-striatal and mesolimbic pathways implicated in motivation, reward, and executive control. It additionally enhances noradrenergic transmission via the locus coeruleus, increases hypothalamic histaminergic tone, and modulates glutamatergic and GABAergic neurotransmission. While these effects support wakefulness and cognitive endurance, they also implicate circuits critical for affective regulation, impulse control, and behavioral inhibition [4,5,6].

Despite these effects, modafinil-induced manic or hypomanic episodes remain relatively rare in the literature, with most data limited to isolated case reports and small series, reported both in patients with established bipolar disorder and, less frequently, in individuals without a prior mood disorder. The apparent rarity may reflect under-recognition, particularly in off-label contexts where subtle affective changes are attributed to stress [1,7,8].

The present report has two objectives: first, to document a severe manic-like episode associated with escalating modafinil use in a young woman without a prior bipolar diagnosis, and to examine its diagnostic evolution over follow-up; and second, to describe the role of an AI conversational platform in the operationalization of an already-formed suicidal intent, a contemporary risk modifier of relevance to clinical practice in academic medical centers.

Case presentation

Patient information

The patient was a 20-year-old female law student, enrolled simultaneously at a law faculty and an affiliated international extension programme. At presentation she was temporarily residing in another city for a summer legal internship and was accommodated in a student dormitory. She lived with her parents during the academic year and described longstanding academic pressure and critical parental expectations.

Medical and psychiatric history

The patient had no known chronic medical illnesses. Her psychiatric history was significant for an episode of impulsive suicidal behavior during early adolescence, in an emotionally charged, demonstrative context following a conflict with her mother regarding academic performance; the act was interrupted. No sustained manic or hypomanic symptoms were documented at that time, and the episode was interpreted as impulsive, stress-related behavior rather than a mood episode. There was no documented history of manic or hypomanic episodes prior to the current hospitalization, and no substance use disorder was reported.

Current illness history

In the weeks preceding admission the patient independently obtained modafinil and, driven by increasing academic demands, gradually escalated the dose. She described increased emotional reactivity, reduced need for sleep, heightened goal-directed behavior, and growing irritability during this period.

On the day of admission, following an intense verbal conflict with her parents centered on academic performance, the patient returned to her dormitory. There she ingested a polypharmacy overdose involving sertraline, gabapentin, lorazepam, modafinil, and piracetam, at doses above the therapeutic range, in a suicidal context. In line with responsible reporting guidelines, specific medication quantities have been deliberately omitted. Prior to ingestion she reported attempting to obtain information about the risk of death associated with her medications using an AI platform, framing her queries hypothetically.

The role of AI

During the clinical interview the patient described having queried an AI chatbot regarding her medications prior to ingestion. Although the platform incorporated safety protocols, the interaction influenced the manner in which she prepared the attempt. As will be discussed below, this represents a transition from impulsive ideation toward technologically assisted preparation rather than a source of the underlying motivation.

Clinical findings

The patient was found by her parents in a sedated state and transported by ambulance to the emergency department, where she presented with marked somnolence, dizziness, and general malaise. Psychiatric examination revealed affective expansiveness, emotional lability, incongruent affect (frequent laughter while discussing severe events), impulsivity, and partial insight. During hospitalization she exhibited pronounced behavioral disinhibition, hyperfamiliarity, and reduced interpersonal boundaries, including an intense emotional attachment to another inpatient, indicating difficulties in boundary regulation and emotional containment.

Diagnostic assessment

Laboratory investigations revealed mildly elevated liver enzymes, consistent with toxic hepatocellular injury secondary to the polypharmacy overdose. No other significant abnormalities were identified. The temporal association between escalating modafinil use and the

onset of manic features, in the absence of any previously documented mood episode, was noted; the differential diagnosis and its evolution over follow-up are addressed in the Discussion section.

Therapeutic interventions

Emergency management included activated charcoal, intravenous isotonic saline, and glucose, followed by somatic re-equilibration. Modafinil and the other psychotropic agents involved in the overdose were discontinued. The patient received inpatient psychiatric care focused on stabilization, behavioral containment, and monitoring of suicide risk.

Follow-up and outcomes

The patient's level of consciousness normalized and the acute affective intensity gradually decreased during hospital stay. She was discharged on a maintenance regimen comprising low-dose escitalopram, quetiapine XR, and valproate, together with a B-vitamin supplement. At an outpatient review approximately one month after first presentation, the serotonergic antidepressant was withdrawn and the patient was maintained on valproate. Over the three-month follow-up period the florid manic features did not recur; however, subsyndromal hypomanic features persisted, alongside residual difficulties in boundary regulation and only partial insight. She resumed her university studies at the start of the autumn term and was advised to remain under continued psychiatric supervision, where the decision to continue or withdraw mood-stabilizing treatment would be guided by her longitudinal clinical course. The persistence of subsyndromal affective symptoms after discontinuation of modafinil — and after withdrawal of the antidepressant — despite ongoing mood-stabilizing treatment, informed the diagnostic reconsideration discussed below.

Discussion

Modafinil has acquired a reputation as a comparatively safe cognitive enhancer, widely perceived as carrying a lower risk of abuse and adverse effects than classical psychostimulants. This case challenges that perception. Modafinil acts principally by inhibiting the dopamine transporter, increasing extracellular dopamine in cortico-striatal and mesolimbic pathways, while also enhancing noradrenergic, histaminergic, and glutamatergic tone [4,5,6]. In vulnerable individuals these effects can overstimulate reward circuitry and the systems governing affective regulation and behavioural inhibition, producing the emotional expansiveness and disinhibition seen in this patient. Its pharmacokinetic profile — efficient absorption, a prolonged elimination half-life, and nonlinear kinetics at higher doses — sustains central stimulation and means that dose escalation, particularly under stress and sleep deprivation, can produce disproportionate increases in dopaminergic and noradrenergic activity [9,19,11,12]. Although modafinil has a relatively wide therapeutic margin and severe somatic toxicity is uncommon, its perceived medical safety does not eliminate the risk of significant psychiatric adverse effects in those facing high cognitive and emotional demands [1,2,3,13].

Modafinil-induced manic or hypomanic episodes nonetheless remain rare in the published literature, largely confined to isolated case reports and small series, and reported most often in patients with established bipolar disorder. Episodes in individuals without a prior mood disorder are particularly uncommon [1,7]. Where they have been described, the course has typically been benign and self-limited: Francois et al., for example, reported modafinil-induced mania in a patient with no personal or family psychiatric history in whom symptoms resolved after withdrawal of the drug and did not recur [8]. Our patient's trajectory diverges from this pattern, which bears directly on the diagnostic interpretation.

The acute presentation — manic features emerging in close temporal relationship with escalating modafinil use, in a patient with no previously documented mood episode — was initially most consistent with a substance-induced manic episode, the principal differentials being bipolar I disorder and emerging personality pathology [14,15]. The longitudinal course complicates a purely substance-induced reading. Subsyndromal hypomanic features persisted after modafinil had been discontinued and, approximately one month after the first presentation, after withdrawal of the serotonergic antidepressant, with the patient maintained on a mood-stabilizing agent. The emergence and persistence of affective symptoms in the absence of the precipitating stimulant suggest that modafinil may have acted as a precipitant unmasking an underlying bipolar diathesis rather than producing a wholly self-limited drug effect [11]. This is consistent with the patient's longstanding pattern of stress-related affective dysregulation and with the decision to maintain mood-stabilizing treatment pending longitudinal review. A definitive classification cannot be made on present follow-up; continued monitoring will be required to determine whether the trajectory consolidates into a bipolar-spectrum disorder.

The case is well explained by a stress-diathesis model, in which the pharmacological effects of modafinil acted as a second hit upon a pre-existing vulnerability shaped by sustained academic pressure and critical familial expectations. A self-reinforcing cycle is apparent: academic pressure motivated off-label modafinil use; the resulting sleep reduction and dopaminergic surge precipitated affective destabilization; and that destabilization culminated in the very breakdown in functioning the patient had sought to avoid. The concurrent ingestion of a serotonergic antidepressant alongside a dopaminergic agent may have further raised the risk of a switch toward mood elevation [13,16].

These observations carry practical implications for prescribing. Wakefulness-promoting agents should not be

regarded as innocuous study aids, and clinicians approached by high-achieving students requesting them should assess the underlying driver — undiagnosed attention or anxiety disorders, or unrealistic academic demands — since addressing the stressor may remove the perceived need for the drug [3,7]. Before initiation, a targeted psychiatric history should screen for past hypomania, mania, or psychosis, and for a history of impulsivity or self-harm, with cardiovascular baseline assessment given the potential for tachycardia and hypertension. Conservative initiation and gradual titration are prudent, since destabilization has been described even at low doses [7], and patients should be cautioned against escalating intake during examination periods. Patients should be given clear warning signs prompting immediate discontinuation and contact — reduced need for sleep without fatigue, racing or pressured speech, a surge in goal-directed or risky activity, and emerging hopelessness or suicidal ideation — and reviewed every two to four weeks during the first months of treatment; substance-induced mood disturbance should be treated as a recognized and high-risk possibility even in the absence of a bipolar diagnosis [7,15]. Clinicians should also remain alert to the possibility of acute self-poisoning in destabilized patients; its management follows established principles of emergency supportive care and decontamination [17].

The monitoring approach is summarized in table I.

The second, and in some respects more novel, dimension of this case concerns the patient's use of an AI conversational agent. It is important to be precise about its role: the AI did not generate her suicidal motivation, which arose in the context of an acute interpersonal crisis superimposed on her affective state. Rather, the AI contributed to the operationalization of an already-formed intent — informing the preparation and execution of the act rather than the decision to act. This distinction matters clinically, because it describes a transition from impulsive ideation to technologically mediated action via an accessible digital tool. Reports that conversations with large language models can shape the specifics of self-harm are beginning to emerge, and studies have demonstrated that multi-step adversarial or indirect prompting can circumvent the safety guardrails built into such systems, including in suicide and self-harm contexts [18,19]. Peer-reviewed clinical documentation of this specific phenomenon nevertheless remains scarce, and our case is offered as an early contribution to that literature.

Several features make AI-mediated information-seeking a distinctive risk modifier. LLM-generated output is frequently perceived as objective and medically authoritative, a perception that may lend unwarranted credibility to retrieved information and bias decision-making in a vulnerable, affectively destabilized individual [20,21]. Framing a query hypothetically or indirectly may be sufficient to elicit content that explicit safety filters are designed to withhold [19,22]. The conversational agent thereby functions not as a static information source but as an interactive partner that can structure and lend apparent legitimacy to a harmful plan, even where protocols intended to block explicit self-harm instructions are in place. For emergency and consultation-liaison psychiatry, this introduces a digital dimension to a risk not captured by conventional assessment. Crisis evaluation may need to incorporate enquiry into patients' digital habits and interactions with AI platforms [23-26], and the broader prevention task includes both dispelling the "safe nootropic" myth among university populations [3,27] and supporting the development of more robust safeguards against the circumvention of AI safety mechanisms [18]. Throughout, and consistent with responsible reporting guidance, we have deliberately refrained from specifying medication quantities or any method detail that could facilitate imitation.

The convergence of these two strands in a single patient is what makes the case instructive. A pharmacological vulnerability and a novel informational one met in an individual already primed by chronic stress: modafinil destabilized affect and impaired inhibition, while an AI platform lowered the practical barrier between intent and action. Neither element alone would fully account for the presentation; together they illustrate how contemporary pressures and tools can interact to produce a severe outcome.

Table I. Modafinil-induced affective destabilization: monitoring and warning signs.

Domain	Recommendation / red flag	Action
Cardiovascular	Blood pressure and heart rate at each visit	Baseline ECG before initiation; monitor for tachycardia/hypertension
Mood	Patient-led mood charting; review every 2–4 weeks in first 3 months	Detect early affective elevation (hypomania) before escalation
Hepatic	Liver enzymes if dose exceeds the recommended range	Screen for hepatocellular injury
Sleep	Sleep-hygiene review at each visit	Ensure wakefulness is not masking chronic sleep debt
Early warning signs	Reduced need for sleep; racing/pressured speech; grandiosity; hyperfamiliarity or disinhibition; impulsive decisions; rapid euphoria-to-irritability shifts; emerging suicidal ideation	Immediate drug cessation and psychiatric safety evaluation

Strengths and limitations

A strength of this report is the availability of longitudinal information, including a prior impulsive suicidal episode linked to academic stress and a three-month follow-up that materially changed the diagnostic picture, revealing persistent subsyndromal hypomanic features after withdrawal of both the stimulant and the antidepressant. The detailed behavioral description during hospitalization adds clinical nuance to existing reports of modafinil-associated mania. Limitations include the single-case design and the absence of longer-term follow-up to clarify whether the trajectory consolidates into a bipolar-spectrum disorder.

Conclusions

This case underscores the importance of caution when prescribing modafinil, particularly to high-achieving young people exposed to significant academic and interpersonal stress. Although rare, modafinil-associated manic and hypomanic features can arise in patients without a prior bipolar diagnosis, and may be accompanied by marked behavioral dysregulation and suicidal risk. In this instance the longitudinal course — persistence of subsyndromal hypomanic features after withdrawal of both the stimulant and the antidepressant — suggests that modafinil may have precipitated, and unmasked, an underlying bipolar diathesis rather than producing a self-limited drug effect; the diagnostic trajectory can only be clarified through continued follow-up. Clinicians should undertake thorough psychiatric assessment before initiation, monitor affective and behavioral change closely, and remain alert to rare but serious psychiatric adverse effects. The case also points to a digital frontier in self-harm risk, in which AI platforms may function as facilitators that lower the barrier between suicidal intent and action without being its source. This aligns with growing concern regarding digital contributions to self-harm and supports incorporating questions about digital habits and AI interactions into psychiatric crisis assessment.

Ethics and consent

Written informed consent for publication of this case report, including the clinical details described, was obtained from the patient, in accordance with ICMJE recommendations. Identifying details have been minimized to protect patient privacy.

Author's contribution

M.M.M.: Conceptualization, psychiatric clinical management and diagnostic assessment of the patient, validation, supervision, project administration, writing-review and editing, final manuscript revision. A.M.-C.: Pharmacological and neurochemical analysis, literature review, formal analysis, data curation, writing-original draft preparation, visualization, corresponding author. P.-A.S.: Psychiatric evaluation, literature search, formal analysis, data curation, writing-original draft preparation, visualization. M.I.M.: Psychiatric evaluation, patient monitoring and clinical follow-up, investigation, validation, writing-review and editing. H.G.C.: Psychiatric supervision, diagnostic oversight, conceptualization, supervision, writing-review and editing.

References

1. Ballon JS, Feifel D. A systematic review of modafinil: Potential clinical uses and mechanisms of action. J Clin Psychiatry. 2006;67:554-66. doi: 10.4088/jcp.v67n0406.
2. Morein-Zamir S, Turner DC, Sahakian BJ. A review of the effects of modafinil on cognition in schizophrenia. Schizophr Bull. 2007;33:1298-1306. doi: 10.1093/schbul/sbm090.
3. Brumboiu I, Porrovecchio A, Peze T, Hurdiel R, Cazacu I, Mogosan C, et al. Neuroenhancement in French and Romanian University Students, Motivations and Associated Factors. Int J Environ Res Public Health. 2021;18:3880. doi: 10.3390/ijerph18083880.
4. Minzenberg MJ, Carter CS. Modafinil: a review of neurochemical actions and effects on cognition. Neuropsychopharmacology. 2008;33:1477-1502. doi: 10.1038/sj.npp.1301534.
5. Volkow ND, Fowler JS, Logan J, Alexoff D, Zhu W, Telang F, et al. Effects of modafinil on dopamine and dopamine transporters in the male human brain: clinical implications. JAMA. 2009;301:1148-1154. doi: 10.1001/jama.2009.351.
6. Ferraro L, Antonelli T, Tanganelli S, O'Connor WT, Perez de la Mora M, Mendez-Franco J, et al. The vigilance promoting drug modafinil increases extracellular glutamate levels in the medial preoptic area and the posterior hypothalamus of the conscious rat: prevention by local GABAA receptor blockade. Neuropsychopharmacology. 1999;20:346-356. doi: 10.1016/S0893-133X(98)00085-2.
7. Murillo-Rodríguez E, Barciela Veras A, Barbosa Rocha N, Budde H, Machado S. An Overview of the Clinical Uses, Pharmacology, and Safety of Modafinil. ACS Chem Neurosci. 2018;9:151-158. doi: 10.1021/acschemneuro.7b00374.
8. Francois D, Chelidze K. Modafinil-Induced Mania in an Elderly Man. Prim Care Companion CNS Disord. 2018;20:17l02187. doi: 10.4088/PCC.17l02187.
9. Robertson P Jr, Hellriegel ET. Clinical pharmacokinetic profile of modafinil. Clin Pharmacokinet. 2003;42:123-137. doi: 10.2165/00003088-200342020-00002.
10. Gerrard P, Malcolm R. Mechanisms of modafinil: A review of current research. Neuropsychiatr Dis Treat. 2007;3:349-364.
11. Nowak K, Chłopaś-Konowałek A, Szpot P, Zawadzki M. The Issue of "Smart Drugs" on the Example of Modafinil: Toxicological Analysis of Evidences and Biological Samples. J Xenobiot. 2025;15:15. doi: 10.3390/jox15010015.

12. Mereu M, Bonci A, Newman AH, Tanda G. The neurobiology of modafinil as an enhancer of cognitive performance and a potential treatment for substance use disorders. Psychopharmacology (Berl). 2013;229:415-434. doi: 10.1007/s00213-013-3232-4.
13. DeBattista C, Doghramji K, Menza MA, Rosenthal MH, Fieve RR; Modafinil in Depression Study Group. Adjunct modafinil for the short-term treatment of fatigue and sleepiness in patients with major depressive disorder: a preliminary double-blind, placebo-controlled study. J Clin Psychiatry. 2003;64:1057-1064. doi: 10.4088/jcp.v64n0911.
14. Maremmani AGI, Bacciardi S, Somers JM, Nikoo M, Schütz C, Jang KL, et al. Substance Dependence Among Bipolar, Unipolar Depression and Psychotic Homeless: A Canadian National Study. Front Psychiatry. 2018;9:701. doi: 10.3389/fpsyt.2018.00701.
15. Sekhon S, Gupta V. Mood Disorder. 2023. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2026.
16. Corp SA, Gitlin MJ, Altshuler LL. A review of the use of stimulants and stimulant alternatives in treating bipolar depression and major depressive disorder. J Clin Psychiatry. 2014;75:1010-1018. doi: 10.4088/JCP.13r08851.
17. Emergency Management of Poisoning. Haddad and Winchester's Clinical Management of Poisoning and Drug Overdose. 2007;13-61. doi:10.1016/B978-0-7216-0693-4.50007-4
18. Teferra BG, Johny N, Huang S, Rueda A, Kamaleddin MA, Dunlop K, et al. Assessing the impact of safety guardrails on large language models using irritability metrics. NPJ Digit Med. 2026;9:148. doi: 10.1038/s41746-025-02333-3.
19. Schoene AM, Canca C. "'For Argument's Sake, Show Me How to Harm Myself!': Jailbreaking LLMs in Suicide and Self-Harm Contexts," 2025 IEEE International Symposium on Technology and Society (ISTAS), Santa Clara, CA, USA, 2025;1-7, doi: 10.1109/ISTAS65609.2025.11269647.
20. Blease C, Locher C, Leon-Carlyle M, Doraiswamy M. Artificial intelligence and the future of psychiatry: Qualitative findings from a global physician survey. Digit Health. 2020 Oct 27;6:2055207620968355. doi: 10.1177/2055207620968355.
21. Lee HS, Wright C, Ferranto J, Buttimer J, Palmer CE, Welchman A, et al. Artificial intelligence conversational agents in mental health: Patients see potential, but prefer humans in the loop. Front Psychiatry. 2025;15:1505024. doi: 10.3389/fpsyt.2024.1505024.
22. McBain RK, Cantor JH, Zhang LA, Baker O, Zhang F, Burnett A, et al. Evaluation of Alignment Between Large Language Models and Expert Clinicians in Suicide Risk Assessment. Psychiatr Serv. 2025;76:944-950. doi: 10.1176/appi.ps.20250086.
23. Lejeune A, Le Glaz A, Perron PA, Sebti J, Baca-Garcia E, Walter M, et al. Artificial intelligence and suicide prevention: a systematic review. Eur Psychiatry. 2022;65:1-22. doi: 10.1192/j.eurpsy.2022.8.
24. Melia R, Musacchio Schafer K, Rogers ML, Wilson-Lemoine E, Joiner TE. The Application of AI to Ecological Momentary Assessment Data in Suicide Research: Systematic Review. J Med Internet Res. 2025;27:e63192. doi: 10.2196/63192.
25. Linardon J, Messer M, Anderson C, Liu C, McClure Z, Jarman HK, et al. Role of large language models in mental health research: an international survey of researchers' practices and perspectives. BMJ Ment Health. 2025;28:e301787. doi: 10.1136/bmjment-2025-301787.
26. Holmes G, Tang B, Gupta S, Venkatesh S, Christensen H, Whitton A. Applications of Large Language Models in the Field of Suicide Prevention: Scoping Review. J Med Internet Res. 2025;27:e63126. doi: 10.2196/63126.
27. McBain RK, Bozick R, Diliberti M, Zhang LA, Zhang F, Burnett A, et al. Use of Generative AI for Mental Health Advice Among US Adolescents and Young Adults. JAMA Netw Open. 2025;8:e2542281. doi: 10.1001/jamanetworkopen.2025.42281.