Management of obsessive-compulsive disorder in adults

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ABSTRACT

Obsessive-compulsive disorder (OCD) is a chronic, often debilitating psychiatric condition characterized by intrusive thoughts and behavioral or mental rituals. Although exposure and response prevention (ERP) remains the first line treatment, many individuals do not experience full remission, highlighting the need for innovation. This review provides a comprehensive and up-to-date synthesis of evidence based treatments for OCD in adults, as well as emerging psychological and biological approaches. It first describes established psychological and pharmacological therapies, highlighting recent findings and factors affecting treatment outcomes. It then examines innovations in psychological care including inhibitory learning informed ERP, acceptance and commitment therapy, inference based therapy, and telehealth delivery methods, as well as emerging biological treatments such as psilocybin, ketamine, and neuromodulation techniques. Cultural and identity related considerations are also discussed, emphasizing the importance of tailoring interventions for diverse populations.

Introduction

Obsessive-compulsive disorder (OCD) is a complex psychiatric condition that is often misunderstood and misdiagnosed. It is characterized by obsessions—persistent intrusive thoughts and images that provoke anxiety and other aversive internal states such as disgust—and compulsions—repetitive behaviors or mental acts performed to alleviate obsessional distress.[1] Individuals also avoid situations that provoke symptoms. OCD often interferes with occupational, academic, family, and social functioning, as well as daily living activities.[2] Its chronicity, associated distress, and impact mean that it is classified among the most disabling psychiatric conditions, often requiring specialized treatment.[3-5]

Obsessions and compulsions present with a wide range of themes, often organized around germs and contamination, responsibility for harm and mistakes, the need for symmetry and exactness, and taboo thoughts related to sex, immorality, and violence.[6 7] Its cause is similarly heterogeneous and not yet fully understood, likely stemming from an interplay of psychological, sociocultural, and biological factors.[8] Despite the lack of clear causal models, empirically supported treatments exist in the form of cognitive-behavioral therapy (CBT), particularly exposure and response prevention (ERP), and pharmacotherapy with selective serotonin reuptake inhibitors (SSRIs).

This review provides clinicians and researchers with a comprehensive review of evidence based treatments for OCD and an in-depth look at emerging and innovative approaches. We outline the status of established psychological and pharmacological interventions, and then explore recent developments that may enhance or augment existing treatments. We examine investigational biological interventions, including psychedelics and neuromodulation, and discuss their integration with established approaches. We also cover cultural considerations in OCD, with particular attention to tailoring care to identity related symptoms and underserved populations.

Sources and selection criteria

We searched PubMed and PsycINFO from 1 January 2010 to 1 September 2025 using the following terms: "obsessive-compulsive disorder", "OCD treatment", "cognitive behavioral therapy for OCD", "exposure and response prevention", "pharmacological treatment for OCD", "deep brain stimulation", "neuromodulation", "psychedelics and OCD", and "novel interventions for OCD". We included articles published in English in peer reviewed scientific journals, focusing on the past five years. Included sources comprised clinical guidelines, systematic reviews with meta-analyses, randomized controlled trials (RCTs), and observational studies relevant to the nature and treatment of OCD. We also reviewed foundational papers on conceptual models of OCD. We excluded case reports, articles without quantitative outcome data, studies using non-standardized diagnostic criteria for OCD, studies with very small samples (for example, n<10), and

studies without sufficient data to calculate response or symptom reduction.

Epidemiology

OCD has a one year prevalence of 1.2% and a lifetime prevalence of 2.3% in the adult population (~1 in 40 adults).[9] It may affect women slightly more often than men, and the age of onset, although earlier for men, is around 19 years on average. Even in the most advanced healthcare systems, individuals may experience OCD for 10 years or more before it is recognized, and in many countries no access to proper evaluation exists. Factors contributing to the under-recognition of OCD include the failure of clients to disclose sometimes embarrassing symptoms, failure of professionals to screen for OCD during routine examinations, and difficulties with differential diagnoses.[10]

Symptoms typically develop gradually, although exceptions include the abrupt onset sometimes observed during pregnancy or post partum and a putative condition termed pediatric autoimmune neuropsychiatric disorders associated with streptococcal infections (PANDAS), which involves the apparent onset of OCD among children following certain viral infections.[11 12] The PANDAS diagnosis remains controversial, in part because definitive evidence linking streptococcal infection to symptom onset is lacking and diagnostic criteria are inconsistently applied.[13] Generally, OCD has a low rate of spontaneous remission, and left untreated it usually runs a chronic and deteriorating course, although symptoms may wax and wane over time (often dependent on levels of psychosocial stress).[14 15]

Established treatments for OCD

Psychological approaches and treatments

The most well established short and long term intervention for OCD is ERP, which is a form of CBT.[16] Use of ERP derives from several empirically supported conceptual models of OCD that share an emphasis on the role of cognitive processes and behavioral learning principles in the maintenance of obsessions and compulsions.[17] As illustrated in figure 1, these models view unwanted senseless intrusive negative thoughts, images, and doubts (for example, the thought of harming a loved one) as universal experiences. Sometimes triggered by external stimuli (for example, seeing a knife), such intrusions usually reflect themes that are important to the person (for example, safety or morality). Whereas most people appraise such thoughts as harmless mental noise, individuals with OCD misappraise them as personally relevant threat cues (for example, thinking about violence means that I am violent). This leads to fear, along with urges to perform compulsive rituals and avoidance to control or remove the perceived threat and gain assurance that the feared consequences will not ensue.

Avoidance and compulsions, however, are counterproductive because they prevent the person from learning that obsessional thoughts (and feelings of anxiety and uncertainty) do not predict actual danger and that the distress abates naturally over time even without ritual behaviors. Compulsions also lead to an increase in the frequency of obsessions by serving as reminders of obsessional intrusions, triggering a preoccupation with the upsetting thought. For example, compulsively checking the locks triggers intrusions about burglaries.[18] Nevertheless, compulsions and avoidance are reinforced by the temporary reduction in distress that they sometimes engender and thus evolve into time consuming patterns that impair functioning and a vicious cycle of obsessions and compulsions.

Treatment process

This model clarifies targets for reducing OCD symptoms: misappraisals of intrusive thoughts must be corrected, and avoidance and compulsions must be decreased. The aim is to foster a new perspective toward obsessional thoughts and stimuli as safe and manageable and not demanding avoidance or compulsions. Treatment protocols call for 12-20 therapy sessions, the first of which involve psychoeducation about OCD and a rationale for ERP. Exposure involves gradually approaching situations and thoughts that evoke obsessive fear. For example, a patient who fears sickness from the floor would be coached to practice touching the floor and imagine the possibility of becoming ill. The patient repeatedly approaches the feared situation without compulsive rituals (such as becoming ill); for example, while refraining from washing compulsions. After each ERP practice, the patient observes that the predicted feared consequences are less likely than expected and the distress evoked during the exercise is temporary and manageable. Family members might be included in therapy as needed to reduce their accommodation and help to coach the patient through exposure practices.[19] Although the exact mechanisms of change in ERP are not fully understood, it is thought to facilitate extinction of obsessional fear by teaching patients new safety based learning (floors are generally safe) that competes with older threat based associations (floors are dangerous), rather than simply erasing fear.[20 21]

Evidence

Since the early 1990s, many RCTs have evaluated the efficacy of CBT involving ERP for adults with OCD, typically using the Yale-Brown Obsessive Compulsive Scale (Y-BOCS), a clinician rated scale of 10 items with total scores ranging from 0 (no symptoms) to 40 (extremely severe) (fig 2).[23] These studies consistently show that patients who complete ERP generally achieve clinically significant improvement (that is, >35% Y-BOCS reduction) that is maintained for several months with average Y-BOCS reductions from 50% to 70%.[24 25] In one recent RCT, for example, the baseline mean Y-BOCS score of 25.3 (standard deviation 4.1) across 28 patients treated with ERP was reduced to 11.4 (5.5) immediately after ERP and

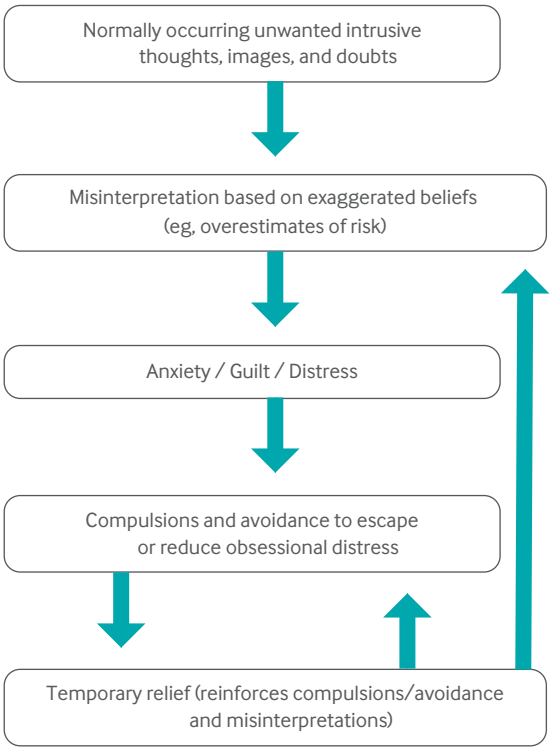

Fig 1 | The general cognitive-behavioral model of obsessive-compulsive disorder forms the basis of exposure and response prevention

remained at 10.9 (6.8) at six months' follow-up.[26] A recent meta-analysis of 30 studies (1793 patients) found a large effect size in favor of ERP (Hedges' g=0.97) when compared with placebo conditions and a moderate effect (g=0.37) in comparisons with active control treatments (for example, stress management).[27] Thus, the effects of ERP are due to its specific techniques over and above non-specific factors such as the therapeutic relationship. Another meta-analysis of 48 RCTs found that ERP based treatments showed overall large post-treatment effects on severity of OCD (g=1.14, 95% confidence interval (CI) 1.31 to 0.97)[28]; and a meta-analysis of 16 RCTs found a medium effect size at follow-up (d=0.43).[25]

Although ERP is effective for most people with OCD, about 20% do not respond. Moreover, a meta-analysis of 21 RCTs reported a weighted mean ERP dropout

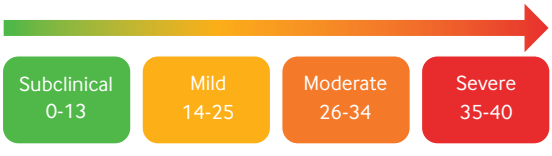

Fig 2 | The Y-BOCS is a clinical interview that is widely used to assess the breadth and severity of symptoms of obsessive-compulsive disorder in clinical and research settings. It contains three sections. The first provides definitions of obsessions and compulsions. The second section includes a symptom checklist of >50 different types of obsessions (eg, thoughts of germs) and compulsions (eg, excessive hand washing). The third section is a 10 item severity scale that assesses the time, interference, distress, resistance to, and control over obsessions (items 1-5 and compulsions (items 6-10). Total scores range from 0 to 40; the figure shows empirically derived clinical cut-offs [22]

(attrition) rate of about 14.7% for adults who began treatment, with overall attrition (including refusals) estimated to be 18.7%.[29] Research has identified factors associated with poorer outcomes, although studies show small effects and not all findings have been replicated. These factors include greater severity of OCD, poor insight into the senselessness of OCD symptoms (and more strongly held dysfunctional beliefs), general cognitive rigidity, comorbidity (that is, with depression, obsessive-compulsive personality disorder, and autism spectrum disorder), a history of poor treatment outcomes, family over-involvement in rituals, and poorer overall quality of life.[25 30-32]

Poorer follow-through with instructions to engage with fear stimuli and resist rituals is strongly associated with worse short and long term outcomes across multiple studies.[33-35] Early adherence, particularly during sessions five to nine, predicts post-treatment OCD severity,[33] and greater adherence to response prevention is linked to higher rates of wellness.[36] Accordingly, clinicians are encouraged to educate patients and families on the importance of adherence and reducing family accommodation.[37]

Biological approaches and treatments

The biological approach to OCD views the disorder as a neuropsychiatric disease and incorporates neurochemical and structural models that attempt to explain the development and persistence of symptoms. The serotonin hypothesis suggests that OCD involves abnormalities in the serotonergic system, which is involved in mood regulation, impulse control, and cognitive flexibility, all of which are associated with OCD. Importantly, however, in vivo studies provide no consistent evidence of such abnormalities in OCD[38]; the model is supported primarily by the effectiveness of SSRIs.[39] Yet treatment response is not a sufficient basis for theories of causation, as SSRIs might exact their effects via different mechanisms (for example, placebo effects[40]). Moreover, the serotonin hypothesis is inherently circular, having been initially formulated from the observation that drugs targeting serotonergic pathways alleviate symptoms of OCD.[41]

Structural and functional models of OCD posit dysfunction in specific brain circuits, particularly the orbitofrontal-subcortical pathways, which are involved in decision making, behavioral regulation, and error detection.[42] The orbitofrontal cortex is associated with evaluation of risk, which is often exaggerated in OCD. The orbitofrontal cortex also communicates with the caudate nucleus, which helps to regulate behavioral responses. The thalamus, which relays information between cortical and subcortical areas, may also be hyperactive in its resting state, reinforcing compulsive behaviors to relieve distress. Neuroimaging studies have found differences in structure and activity levels in the orbitofrontal cortex, caudate nucleus, and thalamus among people with OCD relative to

healthy individuals.[43] However, because they rely exclusively on correlational data, whether the observed differences in studies represent causal factors or merely epiphenomena of OCD is not clear. Consistent with this limitation, no reliable biological or genetic tests are available that can diagnose OCD or distinguish it from other psychiatric conditions. Despite decades of research, no neurochemical, neuroanatomical, or genetic marker has shown sufficient sensitivity or specificity to serve as a diagnostic indicator. This absence of biological markers poses an ongoing challenge for disease based models of OCD.

Evidence

Reviews of the literature indicate that SSRIs are generally associated with a 30-40% reduction in OCD symptoms, and approximately half of patients fail to respond to initial trials.[39] A meta-analysis of 11 RCTs (2372 patients; treatment duration 10-13 weeks), mostly underwritten by pharmaceutical companies, found that SSRIs only modestly outperformed placebo by about 2.65 (95% CI 1.85 to 3.46) points on the Y-BOCS, corresponding to a small effect size (Hedges' g=0.33).[44] The odds of achieving a response (≥35% Y-BOCS reduction) were more than doubled (odds ratio 2.21) with SSRIs versus placebo. A broader meta-analysis of 21 studies (4102 patients) indicated a medium effect size (g=−0.59, 95% CI −0.73 to −0.46), equivalent to approximately a 4.2 point reduction in Y-BOCS compared with placebo.[45]

Evidence suggests that clomipramine, a tricyclic antidepressant with serotonergic effects, is slightly more efficacious than SSRIs.[45 46] Across five RCTs (739 patients), a multivariable meta-regression showed clomipramine to have a larger drug-placebo effect than SSRIs by a difference in Hedges' g of −0.43 (95% CI −0.74 to −0.12), which equates to an estimated additional 3.1 Y-BOCS points advantage over SSRIs.[45] The apparent edge of clomipramine over SSRIs may reflect its older trial era as much as its pharmacology. Many RCTs of clomipramine predated preregistration, enrolled more medication naive samples, and were easier to "unmask" owing to noticeable side effects—factors that inflate drug-placebo separation. Some advantage, however, may be due to its exceptional potency as a serotonin transport blocker and the fact that its primary metabolite, desmethyl-clomipramine, adds norepinephrine reuptake inhibition, giving it broader monoamineric effects. Regardless, SSRIs are favored for their more modest side effect profiles.[47] Studies examining moderators of outcomes with SSRIs suggest that variables predicting a poorer response are higher baseline severity of OCD, poor insight, the presence of symmetry/ordering or contamination/washing symptoms, comorbid personality disorders, tics, or social anxiety disorder and an earlier age of onset.[48 49]

Meta-analyses indicate that higher doses of SSRIs are more effective than low or medium doses, in terms of both symptom reductions and responder rate. A dose-response meta-analysis across 11 trials (2322 patients) found a mean Y-BOCS reduction (versus placebo) of −3.67 (95% CI −4.67 to −2.68) points, with efficacy increasing up to about 40 mg fluoxetine equivalent, after which further dose increases showed little benefit.[50] Dropouts due to adverse effects rose with dose (for example, relative risk 1.81 at 40 mg and 1.96 at 83.7 mg).

Augmentation of SSRIs can produce meaningful additional symptom reduction, although effects vary by the augmenting agent. Meta-analyses of antipsychotic augmentation in SSRI resistant OCD show that atypical antipsychotics yield modest improvements. One meta-analysis of five RCTs comparing augmentation with antipsychotics versus placebo found a medium effect size (Cohen's d=0.40; mean Y-BOCS reduction of 2.34 points).[51] Within that study, however, risperidone showed a medium effect (d=0.53; 3.89 point reduction), whereas aripiprazole showed a large effect (d=1.11; 6.29 point reduction). By contrast, olanzapine and quetiapine did not show statistically significant benefits. Glutamatergic modulators fare somewhat better: across 17 RCTs with 759 patients with OCD; augmentation with such agents (for example, memantine and riluzole) yielded a large reduction in Y-BOCS scores (3.81 (95% CI −4.40 to−3.23) points).[52] Taken together, these data suggest that patients who do not respond sufficiently to SSRI treatment can benefit from augmentation with glutamatergic agents or specific antipsychotics.

Combined treatment

Several RCTs have also examined the efficacy of combining ERP and pharmacotherapy relative to monotherapy with either ERP or drugs for OCD. A meta-analysis of 12 studies (698 patients, including six RCTs that included children, but did not report separate effects by age group) found that combining ERP with drugs (primarily SSRIs) conferred only a 0.08 (95% CI −1.13 to 0.96) point Y-BOCS advantage over ERP alone (or with a placebo) at post-treatment, which was not a significant difference.[53] On the other hand, across nine studies (415 patients), ERP combined with drugs was significantly more effective than drugs alone, including SSRIs, clomipramine, and risperidone (mean Y-BOCS difference 6.60, 95% CI 8.35 to 4.84). This suggests that patients using a combination of drugs and ERP have similar outcomes to those using ERP alone but better outcomes than patients using medication alone.

Innovations in psychological treatments for OCD

Application of inhibitory learning to ERP

Traditionally, the success of ERP has been attributed to extinction via habituation—the natural decline in distress with repeated exposure.[54] However, research on learning and memory has recently broadened this framework, leading to innovations in how ERP is implemented.[20 55] Specifically, feared stimuli are now understood to retain their original threat related meaning while also acquiring an inhibitory (that is, safety) meaning. The therapeutic goal, then, is

strengthening inhibitory associations so that they override the fearful ones.

In practice, optimizing inhibitory learning involves disconfirming negative expectancies and promoting generalization of safety learning across contexts. To achieve disconfirmation of expectancy, exposure is designed to maximize the discrepancy between feared outcomes and actual outcomes—for instance, increasing intensity, frequency, or duration of exposure beyond what the patient perceives as "safe." To promote generalization, exposures are conducted in different contexts, such as varying the treatment setting (office versus home). This tackles the context specific nature of learning, increasing the likelihood that safety associations will transfer to real world situations.

Such clinical strategies are grounded in research on basic learning principles.[20 56] However, much of the evidence comes from studies involving animals or non-clinical human populations,[56] with only a single open pilot trial in OCD to date and an efficacy study now under way.[57 58] Thus, although promising and theoretically sound, the application of this model needs further empirical validation.

Integration of acceptance and commitment therapy

Acceptance and commitment therapy (ACT) offers a framework for treating OCD that shifts the focus from symptom reduction to psychological flexibility—engaging in valued activities despite the presence of obsessional thoughts and anxiety, without the use of compulsive rituals.[59] Rather than trying to lessen obsessions and anxiety, ACT helps patients to relate differently to these experiences, seeing them as transient mental events rather than threats that must be neutralized.

In practice, the goal is to foster willingness to experience obsessional distress and guide behavior toward personally meaningful values. Experiential exercises and metaphors are used to support this work. For example, patients clarify their values in different domains (for example, relationships, work/school) and explore how OCD interferes with living in line with such principles. Metaphors encourage patients to "let unwanted guests (that is, obsessional thoughts) into the party (a metaphor for everyday life)" rather than spending all their energy trying in vain to push them away (that is, perform compulsions) and to imagine themselves letting go of the rope when engaged in an unwinnable game of tug-of-war with a monster (representing obsessions).

Recent studies show promising results, especially when ACT is combined with ERP. A meta-analysis of eight RCTs (366 patents) reported a large effect size (Cohen's d=1.19, 95% CI 1.87 to 0.51) favoring ACT over control conditions for OCD.[59] RCTs comparing ACT and ERP suggest comparable outcomes, with one study (n=58) reporting no significant differences on the Y-BOCS either at post-treatment or at six months' follow-up.[26] Improvement in Y-BOCS scores was 54.4% (post-treatment) and 51.9% (follow-up) for the ACT plus ERP group and 55.0% (post-treatment) and 56.9% (follow-up) for the ERP group. Psychological flexibility consistently emerges as a moderator of symptom improvement with ACT.[60 61] Overall, although more high quality research is needed, ACT seems to be effective for OCD, especially when tailored to individual presentations and combined with ERP.

Inference based cognitive behavioral therapy

Inference based cognitive behavioral therapy (I-CBT) is a form of cognitive therapy that conceptualizes obsessions as the result of reasoning errors rather than intrusive thoughts themselves.[62] Rather than targeting exaggerated perceptions of threat, I-CBT targets a process called inferential confusion, in which individuals blur imagined or hypothetical possibilities with real life probabilities. Patients are helped to recognize how and when they begin to doubt reality, examine the basis of their obsessional doubts, and learn to better trust their sensory experiences. I-CBT facilitates disentangling oneself from imagined obsessional scenarios by challenging the plausibility and origins of obsessive thoughts through logical restructuring, narrative reframing, and exercises that restore epistemic trust in perception.[62]

I-CBT has received growing research and clinical consideration over the past decade. One RCT with 111 patients compared I-CBT with traditional cognitive therapy and mindfulness based stress reduction (MBSR).[63] All three treatments produced large reductions in severity of OCD at post-test, with Y-BOCS score reductions of 11.45 points for I-CBT, 11.72 for cognitive therapy, and 10.20 for MBSR; however, I-CBT was not more effective than the other treatments. Nevertheless, 61.1% of patients treated with I-CBT achieved at least a 35% reduction in Y-BOCS scores and improvement was maintained up to six months, suggesting durability of treatment gains. Another RCT with 197 patients compared I-CBT and ERP based CBT.[64] Both treatments produced large reductions in Y-BOCS scores at post-treatment (10.02 for ERP and 7.97 for I-CBT), with an effect size moderately favoring ERP (Cohen's d=0.44, 95% CI −0.02 to 0.91). A similar pattern emerged at follow-up, with both groups maintaining their gains.

The evidence base for I-CBT is considerably smaller than that for ERP, but existing studies support its efficacy and suggest that it may be particularly suited for clients with poor insight or difficulties tolerating ERP.[62] We must, however, acknowledge that the research on I-CBT has largely been generated by the developers of the treatment. Additional independent research is needed to more firmly establish its effectiveness and clarify the profiles of individuals who might benefit most from this approach.

Telehealth based (virtual) ERP

Although virtual platforms have been used to offer remote OCD treatment (that is, telehealth) for some time,[65] the covid-19 pandemic accelerated their adoption and highlighted their potential to provide

Table 1 | Advantages and drawbacks of in-person and telehealth delivery of exposure and response prevention (ERP) for obsessive-compulsive disorder

Format	Benefits	Drawbacks
In-person ERP	Stronger therapeutic alliance through face-to-face interaction; easier to observe and respond to non-verbal cues; allows real world exposures outside the home with therapist support	Requires travel and less flexible scheduling; may be inaccessible for people in remote or underserved areas; can be challenging for patients with mobility or transportation problems
Telehealth ERP	Greater flexibility and convenience; eliminates geographic and travel barriers; enables the therapist to virtually supervise exposures in the patient's natural home environment; ability to include family or other key support individuals in sessions	Risk of technical and connectivity problems; potential lack of privacy at home; harder to establish a personal connection and pick up on non-verbal cues; some exposures may be difficult to conduct virtually

continuous, effective care when in-person sessions are not practical.[66] As shown in table 1, however, each format has advantages and drawbacks that need to be considered.[67]

An RCT with 14 patients with OCD found that the outcomes of group ERP delivered virtually (Y-BOCS reduction 9.06 points) or in person (Y-BOCS reduction 8.52 points) were not significantly different.[68] Accordingly, we recommend an approach that enables flexibility and personalized care based on the patient's needs. For example, initial intake sessions could be conducted either virtually or in person, followed by several in-person sessions to facilitate the therapeutic relationship and learning the process of ERP in a supervised format. Then, as needed, treatment could progress to virtual exposures with patients in their real world environment. Box 1 includes important factors to consider when deciding on in-person, virtual, or hybrid treatment.

Digital and technology assisted interventions

Digital technologies have emerged as an extension of evidence based care for OCD, aiming to overcome longstanding barriers to treatment, such as limited access to trained clinicians, geographic constraints, and stigma, while maintaining fidelity to core therapeutic principles. Internet based ERP (IB-ERP) programs, such as OCD-NET and NOCD, typically deliver structured modules incorporating psychoeducation, exposure exercises, and homework assignments through online platforms, with varying degrees of therapist support. Across 10 studies (of mixed quality), a meta-analysis found that therapist guided IB-ERP was associated with a mean Y-BOCS reduction of 8.2 points from pre-treatment to post-treatment; unguided IB-ERP was associated with a mean 5.1 point reduction.[70] This underscores the importance of the involvement of a clinician to maximize adherence and help with any necessary troubleshooting.

Smartphone applications that provide tools for self-monitoring OCD symptoms, psychoeducation, and implementing ERP also exist (for example, Good Gamers OCD; NOCD self-guided mode).[71] These tools may be integrated with therapist led treatment but can also function as standalone self-help adjuncts. An RCT in 192 individuals without a diagnosis but reporting OCD symptoms showed that one such tool—the self-guided OCD module in the Intellect app (without therapist guidance)—only minimally outperformed a control condition (an app focused on developing cooperation and teamwork skills) on a self-report measure of OCD symptoms after eight days of use (partial eta-squared (η_p^2)=0.031) and at four week follow-up (η_p^2=0.021). Gamified elements—such as progress badges, reminders, and graded exposure "levels"—seem to increase engagement, particularly among younger adults.[72]

Despite some promising findings, digital interventions have challenges and barriers, including data privacy questions, inconsistent regulation, and variable digital literacy among patients and providers. Moreover, they may not be suitable for individuals with severe symptoms, complex comorbidities, or limited insight who need face-to-face support. Hybrid approaches beginning with clinician led ERP and transitioning to digital maintenance or booster modules may offer the optimal balance between scalability and therapeutic alliance. As research progresses, standardized evaluation of efficacy, user experience, and ethical safeguards are needed to more rigorously evaluate these innovations as a complement to, and in some cases replacement for, human delivered treatment. Table 2 provides a concise overview of recent developments in psychological treatments for OCD.

Box 1: Factors to consider for in-person, telehealth, and hybrid treatment of obsessive-compulsive disorder (OCD)

OCD symptom theme and severity
- For patients with severe symptoms and those requiring hands-on supervision (eg, modeling exposure for contamination concerns), opt for in-person treatment
- Symptoms that necessitate exposure to specific environmental cues (eg, hospitals, restaurants) may be better suited for in-person sessions
- Remote sessions can be effective for more moderate cases or for symptoms that can be tackled through imaginal exposures (eg, intrusive obsessional thoughts)

Geography and travel logistics
- Patients living in remote areas, those with limited access to transportation, and those with busy schedules may find virtual therapy more feasible as it eliminates travel time and offers greater scheduling flexibility

Technological proficiency and access
- Both patient and therapist need reliable internet access and familiarity with virtual platforms for teletherapy to be effective. Those lacking the necessary technology or comfort with digital tools might prefer in-person treatment

Therapeutic relationship
- Building a strong working relationship can be more challenging in a virtual setting. Patients who value face-to-face interaction might benefit more from in-person sessions, although others may find virtual interactions equally effective

Personal preference
- Individual preferences play an important role in the outcome of therapy—even skill based interventions such as exposure and response prevention[69]
- Some patients feel more comfortable and open in a virtual setting, whereas others thrive in the structured environment of an in-person session

Table 2 | At-a-glance comparison of innovations in psychological treatments for obsessive-compulsive disorder (OCD)

Treatment approach	Key mechanisms	Evidence base	Strengths	Limitations
Inhibitory learning ERP	Expectancy violation; safety learning	Early empirical support	Enhances generalization; targets mechanisms	Limited OCD specific trials
ACT	Psychological flexibility; values based action	Moderate (some RCTs)	Acceptability; transdiagnostic	Limited direct comparison with ERP
I-CBT	Correcting inferential confusion	Promising initial RCTs	May work well when patients have OCD with poor insight	Mostly developer led studies
Telehealth	Same as in-person ERP	Strong and growing	Increases access; real world exposures	Technical problem; therapeutic alliance concerns
Digital/technology	Same as in-person ERP	Preliminary with some promising findings	Increases access to ERP; reduces stigma	Data privacy; non-regulation; variable digital literacy

ACT=acceptance and commitment therapy; ERP=exposure and response prevention; I-CBT=inference based cognitive behavioral therapy; RCT=randomized controlled trial.

Innovations in biological approaches for OCD

Glutamate modulating agents

Although targeting serotonergic pathways has long dominated OCD pharmacology, growing interest in glutamatergic dysfunction stems from high rates of incomplete response to SSRIs. Although glutamate is the brain's primary excitatory neurotransmitter and plays a role in learning and neural plasticity, findings linking it to OCD are mixed, largely preliminary, and correlational. No glutamate modulating agents have received approval for OCD from the US Food and Drug Administration. Ketamine, a rapid acting glutamate modulator (via N-methyl-D-aspartate (NMDA) receptor antagonism) has also attracted attention for its potential effects on OCD (see Emerging treatments below). Several compounds have shown promise in small trials, but inconsistent results, methodological variability, and limited replication temper enthusiasm.[73] As such, the glutamate modulating agents described in this section remain potentially interesting, but experimental.[74]

Memantine, an NMDA receptor antagonist traditionally used in Alzheimer's disease, has been examined as an augmenting agent in treatment resistant OCD. Its mechanism involves down-regulation of NMDA receptor mediated excitotoxicity and enhancement of neuroplasticity. In an eight week RCT with 42 patients with OCD comparing fluvoxamine plus memantine with fluvoxamine plus placebo, all patients in the memantine arm met criteria for partial response (≥25% reduction in Y-BOCS) by week 8, compared with 32% in the placebo group. Remission (Y-BOCS ≤16) was achieved in 89% of memantine treated patients compared with 32% of the placebo group.[75] A meta-analysis of four double blind, placebo controlled studies of memantine augmentation showed that patients receiving the agent were 3.61 times more likely to be classified as responders (≥35% Y-BOCS reduction) than those on placebo.[76]

Riluzole, which is approved for amyotrophic lateral sclerosis, is another glutamate antagonist that acts by reducing presynaptic glutamate release and enhancing glutamate reuptake. Open label trials initially indicated efficacy for OCD.[77] However, in a subsequent RCT, 38 patients who had not responded to at least one previous SSRI were randomized to receive either riluzole or placebo alongside their ongoing medication. After 12 weeks, the mean reduction in Y-BOCS scores was 15% for riluzole and 11% for placebo, which was not statistically different.[78]

N-acetylcysteine, which modulates the cystine-glutamate antiporter has also been studied as an adjunct to SSRIs in OCD. A meta-analysis of six augmentation RCTs (195 patients), however, showed maximum improvements of <3 points on the Y-BOCS with the addition of N-acetylcysteine, which is well below the 25% reduction typically considered a partial response.

Neuromodulation techniques

Transcranial magnetic stimulation

Repetitive transcranial magnetic stimulation (rTMS) is a non-invasive procedure that uses powerful magnetic pulses to stimulate neuronal activity (excitatory or inhibitory) in the brain. The most common rTMS target sites are the supplementary motor area, dorsolateral prefrontal cortex, and orbitofrontal cortex.[79] A review of 12 meta-analyses based only on RCTs comparing rTMS with sham control for OCD (282-791 patients) found small to medium effect sizes (adjusted for heterogeneity) of Hedges' g=0.29-0.49 in favor of rTMS.[80] Sources of heterogeneity include rTMS methods (such as precision location of target brain areas), frequency, number of pulses per treatment session, number of sessions, and comorbidities. Although rTMS is considered safe, more research is needed to determine the best procedures, targets, and predictors of outcome.

Transcranial direct current stimulation is a similar procedure involving a lower, constant electrical current to modulate neuronal excitability more subtly and broadly than rTMS. A recent meta-analysis of six RCTs (147 patients) found no advantage over sham control (mean between group difference in Y-BOCS scores −1.13, 95% CI −5.35 to 3.10).[81] Again, heterogeneity across studies was high owing to variation in treatment protocols and patient populations.

Deep brain stimulation

Deep brain stimulation (DBS) is an invasive neurosurgical procedure wherein an electrical device is implanted in a particular region of the brain to

Table 3 | At-a-glance comparison of innovations in biological treatments for obsessive-compulsive disorder (OCD)

Treatment approach	Key mechanisms	Evidence base	Strengths	Limitations
Glutamate modulating agents	NMDA antagonism; glutamate reuptake enhancement; cystine-glutamate exchange	Mixed evidence from small RCTs, open-label trials, and meta-analyses	Potential benefit for SSRI non-responders; generally well tolerated; NAC is low cost	Largely preliminary and correlational evidence; inconsistent findings; no FDA approval; limited replication
rTMS	Modulation of cortical excitability (eg, SMA)	Moderate to strong (meta-analyses)	Non-invasive; effective in treatment resistant cases	Heterogeneous protocols; variable outcomes
DBS	Stimulation of VC/VS, NAC, STN, etc	Moderate, but mainly uncontrolled studies	Large effects for severe, intractable OCD	Invasive; expensive; limited to specialty centers

DBS=deep brain stimulation; FDA=Food and Drug Administration; NAC=N-acetylcysteine; NMDA=N-methyl-D-aspartate); SMA=supplementary motor area; STN=subthalamic nucleus; RCT=randomized controlled trial; rTMS=repetitive transcranial magnetic stimulation; VC/VS= ventral capsule/ventral striatum.

send electrical pulses via a pacemaker. In contrast to ablative neurosurgery, DBS allows clinicians to modify the electrical pulse's voltage to optimize the patient's response. The most common targets are the ventral capsule/ventral striatum and the nucleus accumbens, but other targets include the nucleus of stria terminalis, the anterior limb of the internal capsule, and the subthalamic nucleus.[82] Studies on DBS are limited by small sample sizes, and most are uncontrolled, unmasked open trials.

Integration with ERP

A recent RCT (with 61 patients), however, examined the impact of rTMS (targeting two separate sites) and sham control delivered immediately before ERP sessions.[83] Overall, treatment was effective, with Y-BOCS reductions ranging from 35.8% to 40.3% across groups. However, no significant difference was seen between the rTMS+ERP group and the sham rTMS+ERP group. Although this study suggests a lack of efficacy in integrating rTMS with ERP, the small sample in this study prohibits definitive conclusions. Table 3 provides a concise overview of recent developments in biologically based treatments for OCD.

Cultural and identity based considerations

Cultural influences on OCD and its treatment

Cultural factors play a role in the phenomenology and treatment of OCD.[84] As obsessions concern themes of personal salience, their content varies considerably across cultures. This underscores the need to adapt treatment to the cultural context of each individual, promoting both clinical effectiveness and cultural sensitivity in therapeutic care. In the US, Europe, Australia, and Canada, common OCD themes include contamination, symmetry/ordering, taboo thoughts, and doubt/checking[6]; however, in Hispanic and Latiné populations, themes of contamination and aggression predominate,[85] and among Indian or South Asian individuals, contamination and pathological doubt are common, with gender influencing the manifestation of symptoms.[86] Chinese individuals tend to have more symmetry symptoms, whereas obsessions focused on contamination and aggression are more prevalent in Japan.[87] Research on African populations remains sparse, and recognition of the need for more culturally informed studies in these communities is growing.[88 89]

Although religiosity does not predict OCD, religious beliefs may influence symptom content for people with the disorder.[90 91] For example, Protestant Christians with OCD often have obsessions related to blasphemy and salvation whereas Catholics and Jews tend to obsess about perfectionism related to religious rituals specific to their faiths.[92 93] Muslim patients may focus on purity, with symptoms reflecting Islamic practices of cleanliness.[94] OCD symptoms focused on religion can be particularly challenging to treat with ERP, as distinguishing between normative religious behavior and OCD symptoms may be difficult, highlighting the need for cultural competence.[90] Additionally, minoritized groups experience unique cultural pressures that influence the nature of their symptoms, requiring assessment and treatment to be tailored to their cultural contexts.[87]

Culturally informed intervention emphasizes the need to recognize and adapt to the cultural, racial, religious, and gendered experiences of patients.[95 96] By tailoring treatment to these factors, clinicians can provide personalized, effective care that resonates with the patient's lived experiences and cultural background. For example, a clinician working with a Muslim patient with obsessions about cleanliness might integrate an understanding of Islamic practices regarding ritual washing (wudu) into treatment. Instead of challenging the client's religious practices, the therapist would focus on distinguishing between normative religious behaviors and compulsive rituals driven by OCD, which might involve helping the client to reduce excessive washing behaviors while maintaining adherence to religious customs, ensuring that the therapy aligns with their religious values.

Identity related OCD symptoms

OCD symptoms frequently focus on the fear of (or the fear of becoming) an identity that is marginalized in society, and these obsessions may intersect with societal biases, stereotypes, and stigmas.[95 97] For example, patients with obsessive doubts about their own sexual orientation (for example, fears of being gay) do not typically have negative attitudes toward LGBTQ+ identities. Rather, they fear uncertainty, judgment, and condemnation. As a result, the treatment of such symptoms requires careful attention to the unique challenges posed by obsessions tied to

aspects of personal identity, such as race, gender, sexual orientation, or cultural background. In such cases, ERP should involve exposures that focus on the anxiety linked to unwanted thoughts and doubts about their sexual orientation (for example), while ensuring that the treatment does not inadvertently reinforce the mistaken idea that being gay is inherently immoral (that is, "justice based" ERP).[95]

Some patients experience obsessional thoughts of insults, racial slurs, or other offensive language (or of blurting these out), which they find highly distressing.[98] These thoughts are similarly not reflective of the patients' actual values, and their mere presence leads to guilt, shame, and fear that they might lose control and act on them or be labeled as bigoted. This results in avoidance behaviors, mental rituals, or excessive self-monitoring to prevent the feared outcome. ERP for such obsessions should also be conducted with sensitivity.[97 98] In cases involving fears of using offensive language or being perceived as racist, ERP targets the fear of losing control, not the language itself. Exposures might include hearing feared words or imagining saying them, but never using such language toward others. The aim is to help patients to recognize that having such thoughts does not define their character or intentions.

ERP can sometimes be used to affirm one's identity while also reducing OCD symptoms. For example, patients with religion focused obsessions (that is, scrupulosity) often avoid religious texts and community services. ERP that is identity affirming can help someone to re-engage with their religious practices in ways that are true to their faith without engaging in excessive ritualizing that is spiritually inauthentic.

An important area of further research is the extent to which minority stress contributes to OCD. For example, how and to what degree might obsessional fears be influenced by experiences such as discrimination and stigma?[87 99] Also, little research has investigated cultural sensitivity and the treatment of OCD. The small number of existing studies suggest, however, that members of underrepresented groups (for example, based on gender or race) largely do not differ in treatment outcomes from those from majority groups.[95]

Emerging treatments

Several innovative approaches are being explored for the treatment of OCD in adults, particularly in cases that have not responded to standard interventions. Among these, the use of psychedelic compounds has generated interest, with psilocybin emerging as the focus.[100] Psilocybin acts primarily on serotonin 5-HT2A receptors and shows potential for reducing cognitive rigidity and interrupting repetitive behaviors. It is also thought to alter neural connectivity and promote neuroplasticity, which may facilitate reorganization of the maladaptive thinking patterns in OCD. The only published clinical study on psilocybin for OCD to date included nine participants in an open label design.[101] Y-BOCS reductions ranged from 23% to 100% during at least one dosing session, with no serious adverse events reported.

Early phase RCTs evaluating the efficacy, feasibility, safety, and mechanisms of psilocybin for OCD are under way. One waitlist control study is examining two oral psilocybin doses (25 mg and 30 mg) administered one week apart for treatment resistant OCD.[102] Another RCT is evaluating psilocybin assisted psychotherapy combined with a digital support platform.[103] Two additional open trials are examining the neurocognitive effects of various doses given at different frequencies.[104 105]

Other psychedelic and dissociative compounds have garnered interest as well. Ketamine, a dissociative anesthetic and NMDA receptor antagonist, has shown rapid onset of effects in several studies. In one study, low (0.5 mg/kg) and high (1.0 mg/kg) doses of intravenous ketamine led to significant reductions in OCD symptoms within hours and lasting up to one week.[106] These improvements are thought to arise from glutamate modulation and increased AMPA (α-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid) receptor activation, which may disrupt neural circuits thought to be involved in compulsive behavior.

3,4-Methylenedioxymethamphetamine (MDMA) is another compound of interest. By enhancing emotional openness, empathy, and fear extinction, MDMA may help patients to engage with ERP.[107] Other authors have hypothesized that it might reopen critical periods of social learning, which could be beneficial in weakening the connection between obsessions and compulsions.[108]

An important challenge for research on psychedelic compounds is placebo effects, as the profound and recognizable effects of these substances make blinding difficult. This limits the ability to maintain rigorous control conditions, potentially inflating treatment effects and complicating interpretation of outcomes.

Psychological treatments also continue to evolve, with ongoing trials assessing the efficacy of ACT specifically for religious obsessions,[109] and metacognitive therapy—an understudied form of cognitive therapy—targeting dysfunctional beliefs specific to OCD.[110] These studies represent a shift toward tailoring treatments to symptom subtypes and cognitive vulnerabilities, rather than "one size fits all" treatments. As these trials progress, they may broaden the available toolbox for clinicians managing difficult to treat OCD presentations.

Guidelines

Treatment guidelines for OCD in adults, including older recommendations from the American Psychiatric Association and standards from the UK's National Institute for Health and Care Excellence,[111 112] as well as more recent guidelines from the Indian Psychiatric Society and International OCD Foundation (IOCDF),[113 114] have been consistent in endorsing a stepped care model that prioritizes evidence based interventions tailored to symptom

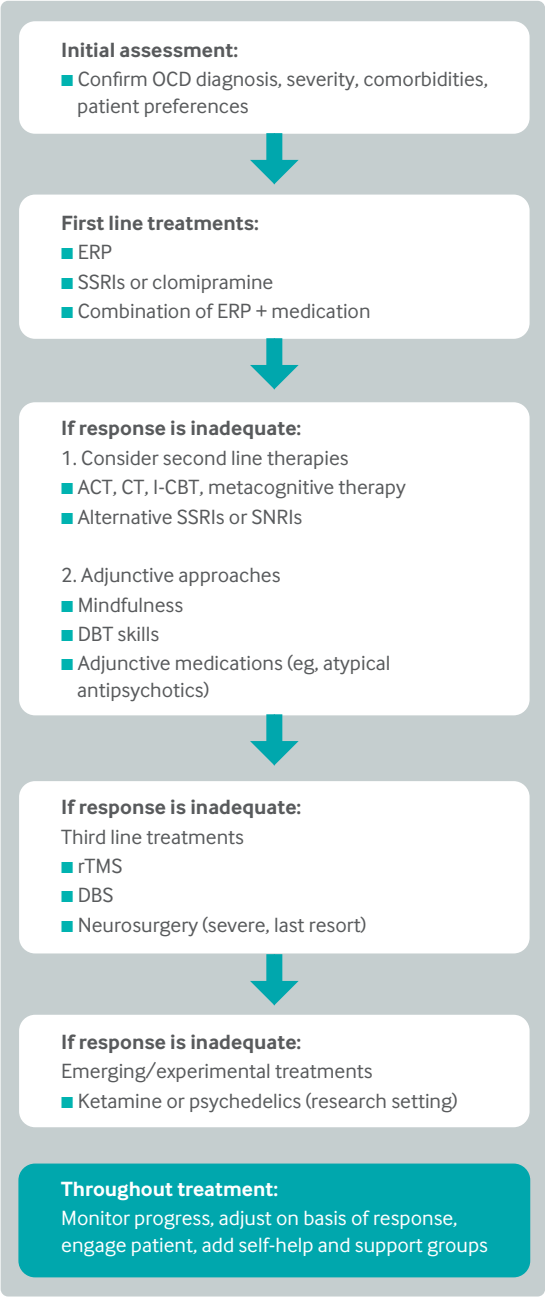

Fig 3 | Treatment decision algorithm based on International OCD Foundation guidelines. ACT=acceptance and commitment therapy; CT=cognitive therapy; DBS=deep brain stimulation; DBT=dialectical behavior therapy; ERP=exposure and response prevention; I-CBT=inference based cognitive behavioral therapy; OCD=obsessive-compulsive disorder; SNRI=serotonin–norepinephrine reuptake inhibitor; SSRI=selective serotonin reuptake inhibitor; rTMS=repetitive transcranial magnetic stimulation

severity and individual needs. ERP is reliably recognized as the first line psychological treatment owing to its strong empirical support. SSRIs are first line drugs, often prescribed at higher doses and for longer durations than in depression. The combination of ERP and SSRIs is frequently recommended for moderate to severe OCD.

When first line approaches are insufficient, guidelines recommend clomipramine or antipsychotic augmentation (for example, risperidone or aripiprazole). Adjunctive therapies, including ACT and I-CBT, are supported as second line options. Recent updates also recognize the growing role of telehealth.[114] For treatment refractory cases, neuromodulation techniques such as rTMS may be considered.[114] The IOCDF guidelines caution against unproved treatments such as over-the-counter supplements and emphasize culturally sensitive care, especially in underserved and underrepresented populations. Figure 3 provides an algorithm for treatment decisions based on the IOCDF's guidelines

GLOSSARY OF ABBREVIATIONS

- ACT—acceptance and commitment therapy
- CBT—cognitive-behavioral therapy
- CI—confidence interval
- DBS—deep brain stimulation
- ERP—exposure and response prevention
- IB-ERP—internet based ERP
- I-CBT—inference based cognitive behavioral therapy
- IOCDF—International OCD Foundation
- MBSR—mindfulness based stress reduction
- MDMA—3,4-methylenedioxymethamphetamine
- NMDA—N-methyl-D-aspartate
- OCD—obsessive-compulsive disorder
- PANDAS—pediatric autoimmune neuropsychiatric disorders associated with streptococcal infections
- RCT—randomized controlled trial
- rTMS—repetitive transcranial magnetic stimulation
- SSRI—selective serotonin reuptake inhibitor
- Y-BOCS—Yale-Brown Obsessive Compulsive Scale

QUESTIONS FOR FUTURE RESEARCH

- How can emerging psychological approaches (eg, acceptance and commitment therapy, inference based cognitive behavioral therapy, inhibitory learning based exposure and response prevention (ERP)) be optimized and integrated with ERP to improve outcomes for patients who do not respond to standard treatments?
- What are the mechanisms through which psychedelic compounds (eg, psilocybin, ketamine, 3,4-methylenedioxymethamphetamine) reduce obsessive-compulsive disorder (OCD) symptoms, and how can these be effectively combined with psychotherapeutic interventions?
- Which characteristics of patients (eg, symptom subtype, cultural identity, comorbidity, treatment history) best predict differential response to specific treatments, including novel and traditional approaches?
- Does including a partner, family member, or other significant support person in therapy lead to better outcomes than individual ERP without such support?
- How can telehealth, virtual reality, and neuromodulation technologies be adapted to maximize accessibility, engagement, and clinical effectiveness across diverse OCD populations?

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Members of the International OCD Foundation who have lived experience with obsessive-compulsive disorder (OCD), as individuals with the disorder and as people with family members with OCD, reviewed a draft of this manuscript and made suggestions and edits on the content and presentation. The primary suggestions concerned avoiding lengthy discussions of individual study methodology and instead focusing on the relevant results and conclusions. We agreed with this feedback and incorporated it into the final drafts.

Conclusions

Although OCD is a frequently debilitating condition, substantial progress has been made in developing and refining effective treatments. ERP continues to serve as the first line treatment, supported by decades of robust empirical evidence. However, response rates and treatment accessibility remain imperfect, underscoring the need for innovation. Recent advances, including process based therapies such as ACT and I-CBT, technology assisted formats, and novel biological interventions such as neuromodulation and psychedelics, offer promising avenues for expanding the reach, acceptability, and personalization of care. Growing attention to cultural and identity related factors reflects a necessary emphasis on inclusive and equitable treatment. Future research should prioritize dismantling studies that clarify active treatment components, comparative effectiveness trials that inform treatment selection, and efforts to integrate emerging approaches with established evidence based practices. Additionally, greater focus on scalability, implementation, and culturally informed care will be critical in ensuring that scientific advances translate into real world benefits for the diverse population of people affected by OCD.

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