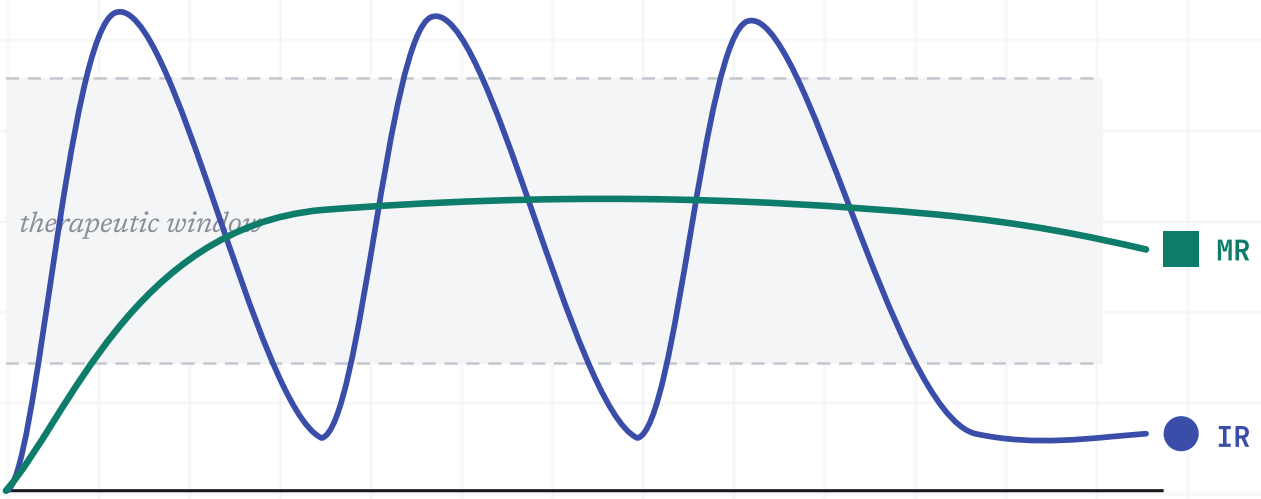
WEAVE
CENTRE FOR INTEGRATIVE PSYCHIATRY

APORIA · ISSUE SEVEN
07



The Shape of the Dose.

The same molecule, at the same daily dose, can reach the blood as a spike or as a steady line. Immediate-release, modified-release, orodispersible, transdermal, long-acting injectable. *The dilemma is rarely which drug. It is which form, and whether you can get it in India.*

FORMULATIONS IN PSYCHIATRY
Dr. Wilfred D'souza

REVIEWED BY DR. NIHARIKA REDDY
June 2026

01 The fork in the first prescription

DEFINITIONAL

Two prescriptions can carry the same molecule, the same milligrams, the same total daily dose, and behave like two different drugs. One is immediate-release: the tablet dissolves, the drug floods in, the plasma level spikes and then falls away before the next dose. The other is modified-release: the same dose, metered out over hours, so the level climbs gently and holds. The choice between them is not cosmetic. It decides peak-related side effects, trough-related relapses, how many times a day the patient has to remember, and sometimes whether the drug works at all.

02 What a formulation does to a drug

APPLIED PHARMACOKINETICS

Every drug has a therapeutic window: a band of plasma concentration high enough to act, low enough to spare the patient dose-related harm. Above the band the patient meets the side effects that track peak concentration; below it the drug is simply absent. The whole craft of a formulation is to keep the patient inside that band for as much of the day as possible, with as little effort from the patient as possible.

This issue follows the dose through five shapes it can take, and asks two questions of each. What does the formulation do to the drug? And what can you actually prescribe in an Indian clinic? The four families below recur throughout, each fixed to one colour and one shape so they survive a photocopy.

14% **The number the non-oral routes escape.** Atorvastatin is completely absorbed from the gut, yet only about 14 percent reaches the blood. First-pass metabolism in the gut wall and liver, not the dose on the box, is what a patch or an injection bypasses.[5]

THE FOUR FAMILIES ● IR immediate-release ■ MR modified-release ◆ NO non-oral (patch, spray) ○ LAI long-acting injectable

QUICK CHECK

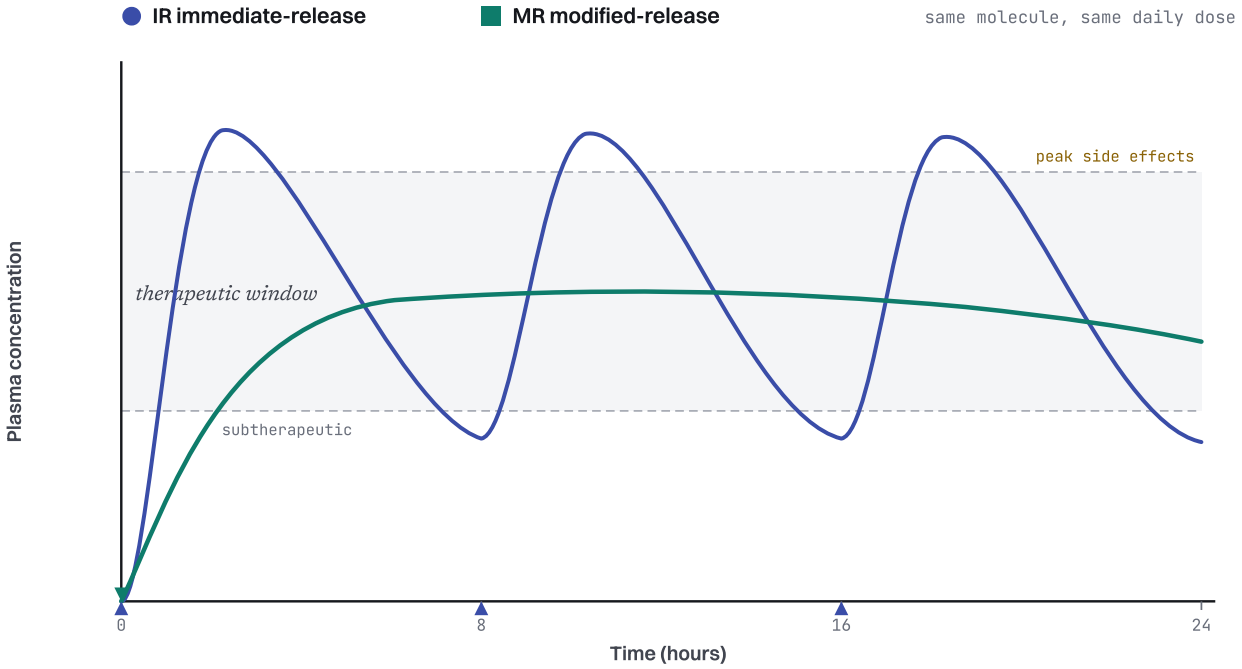
A tablet relabelled SR carries the same milligrams as the plain one. Is the patient getting more drug, or the same drug spread out?

A The same total dose, metered over hours: a lower peak and a higher trough, not a larger amount. A modified-release form changes the shape of the dose, not how much of it the patient receives.[1,2]

The figure on the next page is the whole argument in one image: the same daily dose, drawn as immediate-release against modified-release.

F1 The shape of the dose

CONCENTRATION OVER TIME



The area under each curve (total exposure) is comparable.
Modified-release changes the *shape* of the dose, not the amount.

IR dosed 3x/day (peaks + troughs) - MR dosed 1x/day (steady)

HOW TO READ THIS Follow either line across the 24 hours. The area under both is the same daily dose; the blue immediate-release curve spikes above the peak-side-effects line and then falls below the window between doses, while the teal modified-release holds one steady band inside it.

The two curves carry the **same molecule at the same daily dose**. Everything that differs follows from the shape, not the amount.

WHAT THE CURVE SHOWS

1. **Same area, same exposure.** Modified-release does not deliver more drug. The area under the curve, the total the patient actually receives, is identical; only its distribution across the day changes. Modified-release tacrolimus once daily matches the twice-daily immediate-release form on total exposure and trough, at a lower peak.[1]

2. **Lower peak, fewer side effects.** Flatten the peak and you lose the dose-related side effects that ride it. The patient meets a gentler maximum for the same therapeutic work.[2]

3. **Higher trough, no gaps.** Raise the trough and the level stops dropping out of the window between doses, where partial response and breakthrough symptoms live.[2]

4. **Fewer doses, real adherence.** Once daily instead of three times is a regimen the patient can keep, which for many drugs matters more than any pharmacological nicety.[2]

A drug with a longer effective half-life takes longer to reach steady state, but once there it fluctuates less across the dosing interval.[7]

02 / cont. How the shape is engineered

MECHANISM

Slowing the release. Modified-release is built three main ways. The names on the box (SR, CR, XR, ER) are marketing letters, not a standard grammar; only the product information tells you which mechanism is inside.[2]

THREE WAYS TO SLOW A TABLET

1. **Osmotic pump (OROS).** Water is drawn in and drug is extruded through a laser-drilled orifice at a near-constant rate, giving the flattest once-daily curve.[3]
2. **Matrix erosion.** The drug is held in a polymer that swells or erodes slowly, so it diffuses out over hours.[2]
3. **Coated multiparticulate beads.** Hundreds of tiny coated units, a multiple-unit pellet system, release in overlapping waves.[8,9]

Surviving the first pass. Bioavailability is the fraction of an oral dose that reaches the systemic circulation. Much can be lost to first-pass metabolism in the gut wall and the liver before the drug arrives.[4,6] Atorvastatin is completely absorbed yet reaches the blood at only about 14 percent because of it.[5] This is the quiet advantage of the non-oral routes: a patch or an injection bypasses the gut and the liver entirely, so the first-pass loss never happens.

Dissolving without slowing. An orodispersible tablet disintegrates on the tongue without water. It is bioequivalent to the swallowed tablet: in a controlled study the orodispersible form met the 80 to 125 percent limits for both peak and total exposure.[10,11] The point is supervised, swallow-free convenience for a patient who cannot or will not take a tablet, not faster entry to the brain. Releasing a drug faster is not the same as releasing more of it.

AT THE BEDSIDE

A patient on plain quetiapine twice daily reports a heavy one-to-two-hour sedation peak after each dose. Three moves sit on three different axes. Switch to quetiapine SR and the slower release flattens that peak. Switch to an orodispersible tablet and you only remove the glass of water, which answers a swallowing problem, not this one. Neither changes the molecule or the total daily dose.[2]

HOLD THIS

Faster, slower, and more are three different things

A modified-release form does not deliver more drug; it delivers the same amount over longer. An orodispersible form does not deliver drug faster to the brain; it removes the glass of water. A non-oral route does not change the molecule; it changes where the molecule enters. Keep the three axes (how fast, how long, by what route) separate, and most formulation questions answer themselves.

03 The five shapes, side by side

THE TABLE TO REMEMBER

Six forms, four families, one table. Read each row as a trade: every formulation buys one clinical advantage and charges one caveat for it. Onset and dosing frequency are typical, not absolute, and vary by molecule.

TABLE 1 **What each formulation buys, and what it costs**

Form	What it is	Onset	Doses / day	Choose when	Key caveat
● IR immediate-release	Whole dose released at once	30 to 60 min	2 to 3	First line; rapid titration; when the dose may change often	Peaks and troughs; frequent dosing leans on memory
■ MR modified-release	Same dose metered over hours	Slower, blunted	1	Peak side effects; once-daily adherence; smoother level	Do not crush or split; not interchangeable mg-for-mg with IR
● ODT orodispersible	Dissolves in the mouth, no water	As IR	As IR	Cannot swallow; covert non-adherence; supervised dosing	Convenience, not a pharmacokinetic advantage
◆ Patch transdermal	Steady delivery through skin	Hours to a day	One patch lasts 1 to 7 days	Steady levels; avoid first-pass; unreliable swallowing	Skin reactions; a skin depot lingers after removal
◆ Spray intranasal	Across nasal mucosa, fast	Minutes	Per protocol	Rapid effect needed (esketamine in resistant depression)	In-clinic monitoring; dissociation, transient pressure rise
○ LAI depot injection	Slow-release injection	Days to weeks	Every 2 to 24 weeks	Non-adherence; relapse prevention; covert default	Slow to load and to clear; cannot be withdrawn

THE FOUR FAMILIES BEHIND THE SIX FORMS

- **Immediate-release** (the circle, IR and ODT). Flexible and fast to titrate; the cost is peaks, troughs, and frequent dosing.
- **Modified-release** (the square). One smooth daily curve; never crush it, and do not assume it equals the IR dose milligram-for-milligram.
- **Non-oral** (the diamond, patch and spray). Steady levels with no first pass, or rapid onset by nose; the cost is skin care or in-clinic monitoring.
- **Long-acting injectable** (the ring). The answer to non-adherence; slow to load, slow to clear, and impossible to take back.

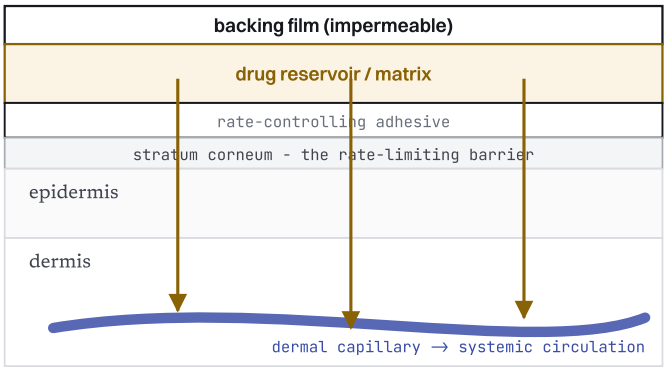
Orodispersible tablets sit in the immediate-release family: they change how the tablet is taken, not how the drug behaves. Patch and spray share the non-oral family; both skip the gut.

Off the oral route

A drug delivered at a constant rate through skin reaches steady levels with far less peak-to-trough swing than intermittent tablets, and bypasses gut absorption and hepatic first-pass altogether.[36] The psychiatric and neurological patches make the case concrete.

THE PATCHES THAT MATTER, AND WHY

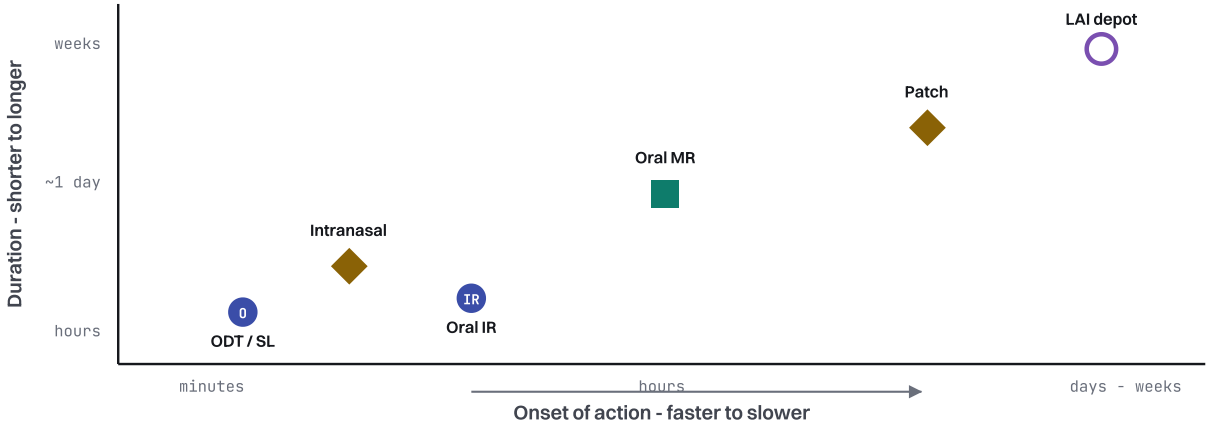
- **Rivastigmine.** Matches the exposure of the highest oral dose at roughly a third of the peak concentration (8.7 against 21.6 ng/mL), with about three times fewer reports of nausea and vomiting.[37,38]
- **Selegiline.** Sparing the gut wall's monoamine oxidase is why a transdermal MAO inhibitor carries far less tyramine food risk, but only at the low dose: no diet restriction at 6 mg per 24 hours, restriction returning at 9 and 12 mg.[39,40]
- **Methylphenidate and clonidine.** The methylphenidate patch delivers steadily over a nine-hour wear and can be removed to end the effect early;[41,42] clonidine reaches steady state over days and holds it for a week.[43]
- **Intranasal esketamine.** The outlier: the nose buys speed, a rapid antidepressant onset in resistant depression, at the cost of supervised in-clinic dosing.[44,45]



Steady diffusion down a fixed gradient gives near-constant levels for 1 to 7 days, bypassing gut and liver.

removing the patch stops delivery, but a skin depot lingers

FIGURE 2 **Route maps onto speed and duration**



04 When the form changes the outcome

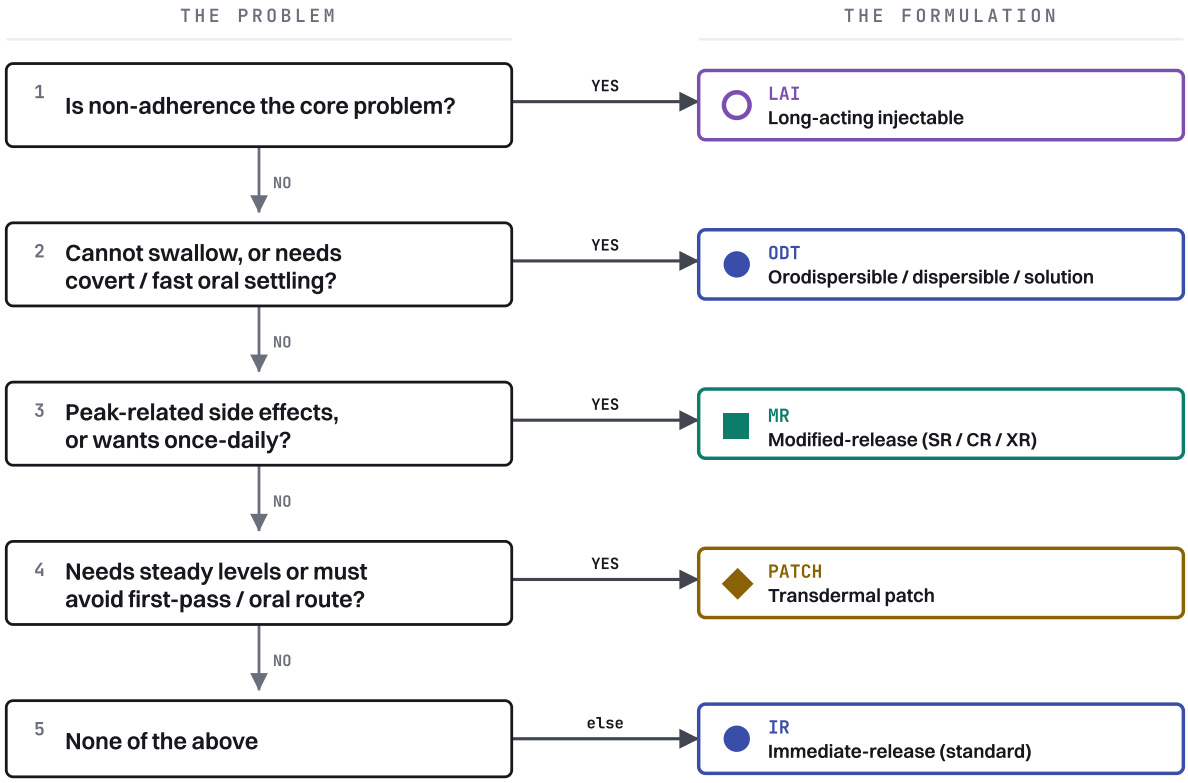
THE DECISION

Most of the time the formulation is a convenience. Sometimes it is the treatment. The question is not which form is best in the abstract, but which clinical lever the patient in front of you most needs pulled. Each lever points to a family.

THE FOUR LEVERS

1. **Adherence.** If the patient stops taking it, no oral form helps. The long-acting injectable removes the daily decision.
2. **Swallowing.** If a tablet cannot go down, or must be taken covertly, an orodispersible, dispersible, or liquid form solves it without changing the drug.
3. **Peak tolerability.** If the side effects track the peak, or the patient simply wants once-daily, modified-release flattens the curve.
4. **Steadiness and route.** If the patient needs constant levels or cannot use the gut, a transdermal patch delivers steadily and skips the first pass.

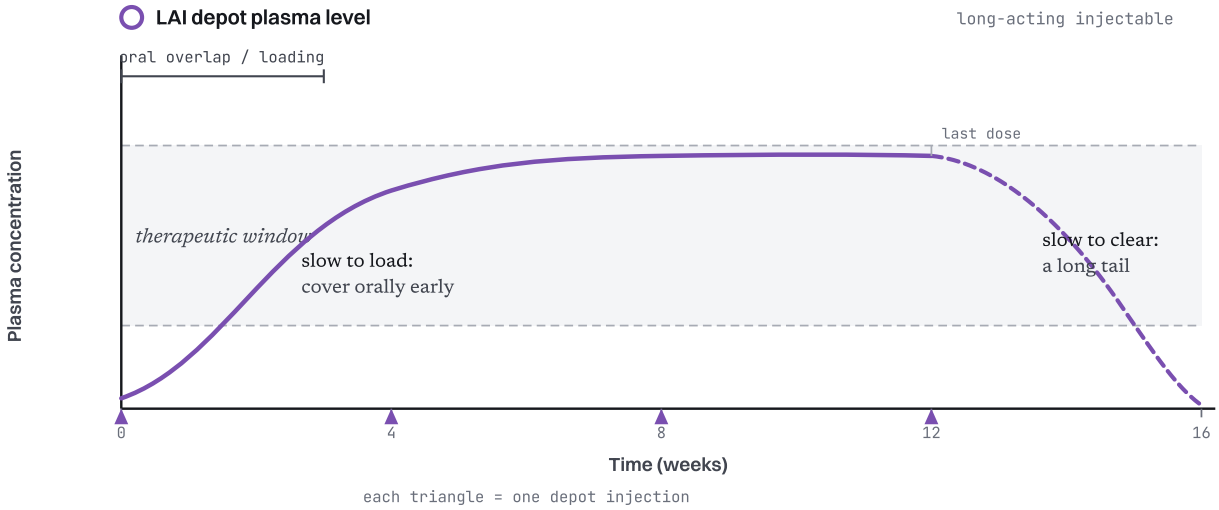
The flow below turns those four levers into a single ordered question, ending in one of five forms.



HOW TO READ THIS Start at the top and answer each question in turn. The first YES sends you straight across to its formulation family; a NO drops you to the next question, and the final box catches everyone else as standard immediate-release.

The injectable that answers adherence

The long-acting injectable is the one formulation that treats a problem the molecule cannot: the patient who stops taking it. Across mirror-image and randomised data, depots reduce hospitalisation and relapse against the same patients' oral treatment, with the clearest signal in real-world use and a genuine, if smaller, effect in trials.[24,25,26] The benefit is not reserved for chronic non-adherence; it appears in early-phase illness too.[27] The cost is paid in pharmacokinetics. Depots show flip-flop kinetics, where the slow release, not elimination, sets the apparent half-life, so they are slow to reach steady state and slow to wash out.[13,15,16]



HOW TO READ THIS Each triangle on the baseline is one injection. The solid violet line climbs slowly to a steady level over the first weeks, which is why oral cover runs alongside it; the dashed tail after the last dose shows how long the depot keeps releasing once it is stopped.

That slow loading dictates how each depot is started. The rules are molecule-specific, and getting them wrong leaves the patient unprotected for exactly the weeks relapse is most likely.

STARTING A DEPOT, BY MOLECULE

1. **Risperidone microspheres.** Almost no drug is released for the first three weeks, so oral antipsychotic cover is mandatory through initiation.[17]
2. **Aripiprazole once-monthly.** A fortnight of oral overlap is needed at the classic start; the newer two-injection start removes the overlap entirely.[19,20]
3. **Olanzapine pamoate.** Carries the formulation-specific post-injection delirium-sedation syndrome from accidental intravascular spread, which is why every dose needs three hours of observation.[21]
4. **Paliperidone palmitate.** The interval now stretches to six-monthly, a single injection covering half a year.[23]

05 What comes as what, in India

AVAILABILITY

A formulation you cannot buy is a formulation you cannot prescribe. The table below maps the common psychotropics to the forms actually marketed in India. Brand names are illustrations, not endorsements, and one example is given per form. The forms are coded by family.

FORMS `IR` immediate-release `ODT` orodispersible `liq` oral liquid `MR` modified-release `LAI` depot

TABLE 2 **India availability by molecule**

Molecule	Class	Forms in India	Example brands	Note
Olanzapine	Atypical AP	`IR` · `ODT` · `liq` · `LAI`	Oleanz, Oleanz RT, Tolaz LA	LAI = Tolaz LA (Torrent)
Risperidone	Atypical AP	`IR` · `ODT` · `liq` · `LAI`	Sizodon, Sizodon MD, Risperdal Consta	Widest range; no oral MR
Quetiapine	Atypical AP	`IR` · `MR`	Qutipin, Qutipin SR	SR is India's XR
Aripiprazole	Atypical AP	`IR` · `ODT`	Arpizol, Arip MT	Depot not marketed in India
Paliperidone	Atypical AP	`MR` (oral, only form) · `LAI`	Palido OD, Invega Sustenna	No IR exists anywhere
Amisulpride	Atypical AP	`IR` · `ODT`	Solian, Amazeo OD	No MR, no depot anywhere
FGA depots	Typical AP	`LAI` (decanoate, IM)	Haloperidol / Fluphenazine / Zuclopenthixol decanoate	Depot only; oral forms historical
Lithium	Mood stabiliser	`IR` · `MR` (SR)	Licab, Lithosun SR	No liquid, ODT or depot
Valproate / divalproex	Mood stabiliser	`IR` · `MR` (Chrono) · `liq`	Encorate, Valparin Chrono, syrup	"Chrono" = controlled-release
Lamotrigine	Mood stabiliser	`IR` · `disp` · `MR`	Lamitor, Lamitor DT, Lamitor OD	MR = Lamitor OD; US Lamictal XR absent
Carbamazepine	Mood stabiliser	`IR` · `MR` (CR) · `liq`	Tegrital, Tegretol CR, suspension	Plain = Tegrital; CR branded separately
Venlafaxine	SNRI	`IR` · `MR` (XR)	Venlor, Venlor XR	XR capsule: do not crush
Bupropion	NDRI	`IR` · `MR` (SR + XL)	Bupron, Bupron SR, Bupron XL	India markets all three forms
Fluoxetine	SSRI	`IR` · `liq`	Fludac, Fludac syrup	No weekly form in India
Methylphenidate	Stimulant	`IR` · `MR` (SR / OD)	Inspiral, Addwize OD; Concerta	Concerta OROS registered but supply-limited
Atomoxetine	Non-stim ADHD	`IR` (cap / tab)	Axepta, Attentrol	Inherently once-daily; no separate MR
Clonazepam	Benzodiazepine	`IR` · `ODT`	Lonazep, Lonazep MD	Mouth-dissolving widely used
Melatonin	Chronobiotic	`IR`	Meloset	Prolonged-release (Circadin) not in India

Availability shifts; confirm the current brand and strength on a pharmacy listing or the product insert before prescribing. The clinically loaded gaps are the missing modified-release and depot forms, not the well-stocked plain tablets.

06 Three ways to get it wrong

PITFALLS

Crushing what must not be crushed. Breaking a modified-release or coated tablet defeats the engineering and can release the whole dose at once. Crushing is a recognised cause of altered pharmacokinetics, lost efficacy, and harm, and it is common: a quarter of solid doses on one psychiatric ward were crushed or opened, many without authorisation.[29,30] Alcohol makes it worse for some products, dissolving the matrix and dumping the dose.[32,2] Extended-release stimulants are misused the same way.[31] When a patient cannot swallow, reach for a form designed for it (orodispersible, liquid, patch), not a crushed modified-release tablet.[28,33,35]

Switching as if the milligrams matched. Immediate-release and modified-release are not interchangeable dose-for-dose. The same number on the box can mean a different peak, a different duration, and a different dosing frequency. Switch deliberately, against the product information, not by reflex.

Starting a depot without cover. A long-acting injectable is slow to load. Skip the oral overlap where the molecule needs it and the patient is subtherapeutic for weeks, exactly when relapse is most likely. The same slow kinetics mean a depot cannot be taken back once given.

SAFETY

Do not crush or split these

Modified-release and coated forms lose their safety the moment the coating breaks. The common psychiatric offenders:

01 Bupropion SR and XL; venlafaxine XR capsules

02 Quetiapine SR; lithium SR / CR; divalproex / valproate "Chrono" CR

03 Carbamazepine CR; paliperidone oral (an osmotic ER system)

04 Methylphenidate OD / extended-release; any tablet marked "do not crush" on the insert

05 When in doubt, check the product information before halving a tablet or opening a capsule

TABLE 3 **The letters on the box**

Abbreviation	What it usually means
IR	Immediate-release: the whole dose is released at once.
SR / CR	Sustained- or controlled-release: drug metered out over hours, usually once or twice daily.
XR / ER / XL	Extended-release: the longest oral profile, typically once daily. The letters are not standardised across makers.
OROS	Osmotic-release oral system: an osmotic pump driving a flat once-daily curve.
MUPS	Multiple-unit pellet system: many coated beads releasing in waves.
ODT / MD / DT	Orodispersible, mouth-dissolving, dispersible: dissolves without water; behaves like IR once absorbed.
LAI	Long-acting injectable, or depot: a slow-release injection lasting weeks to months.

07 Before you prescribe

THE TAKEAWAYS

Formulation is usually a convenience and occasionally the treatment; the skill is telling the two apart, then checking the form exists where you practise. Four reminders carry most of the value.

WHAT THIS ISSUE COMES DOWN TO

1. **Name the problem first.** A peak, a trough, a swallow, or adherence. The answer points to a family: modified-release for peaks and once-daily, an orodispersible or liquid for swallowing, the long-acting injectable for adherence.
2. **Same shape, not the same drug.** Immediate-release and modified-release are not interchangeable milligram-for-milligram. Switch against the product information, never by reflex.
3. **Never crush modified-release.** Breaking the coating can dump the whole dose at once. When a patient cannot swallow, choose a form built for it, not a crushed tablet.
4. **Cover the depot while it loads.** A long-acting injectable is slow to reach steady state and cannot be taken back. Plan the oral overlap the molecule needs.

REMEMBER

PROBLEM · SHELF · COATING · COVER

Name the **problem** (peak, trough, swallow, or adherence); confirm the form sits on the Indian **shelf**; if it is modified-release, never break the **coating**; if it is a depot, give the oral **cover** the molecule needs while it loads.

BEDSIDE CHECK

Before you sign the prescription

For any psychotropic, in order:

01 Which problem am I solving: a peak, a trough, a swallow, or adherence? The answer names the family.

02 Does the form I want exist in India, and as what brand and strength?

03 If it is modified-release, have I told the patient never to crush or split it?

04 If I am switching IR to MR or back, have I checked the product information instead of matching the milligrams?

05 If it is a depot, does this molecule need oral overlap, and have I planned it?

Get those four right and the rest is detail. The clinician who can name the right form for the patient in front of them, and knows whether it exists on the Indian shelf, has done the harder half of prescribing well.

R References

ALL PUBMED-VERIFIED

1. First MB, Fitzsimmons WE. Modified release tacrolimus. Yonsei Med J. 2004. PMID 15627307
2. Biopharmaceutics of solid oral modified-release products in approved FDA NDAs. Eur J Pharm Biopharm. 2023. PMID 37984592
3. Conley R, et al. Clinical spectrum of the osmotic-controlled release oral delivery system (OROS). Curr Med Res Opin. 2006. PMID 17022845
4. Mehvar R. Clearance concepts: fundamentals and application to pharmacokinetic behaviour. J Pharm Pharm Sci. 2018. PMID 30041730
5. Lennernas H. Clinical pharmacokinetics of atorvastatin. Clin Pharmacokinet. 2003. PMID 14531725
6. Gut wall metabolism: prediction of human drug absorption and first-pass elimination. AAPS J. 2016. PMID 26964996
7. Heise T, Meneghini LF. Insulin stacking versus therapeutic accumulation. Endocr Pract. 2014. PMID 24013982
8. Kallai-Szabo N, et al. Review on starter pellets: inert and functional cores. Pharmaceutics. 2022. PMID 35745872
9. Pellets and pelletization: emerging trends. Acta Pol Pharm. 2016. PMID 29634093
10. Lv H, et al. Bioequivalence of an orodispersible tablet of sildenafil citrate. Clin Pharmacol Drug Dev. 2020. PMID 32463593
11. Oral dispersible system: a new approach in drug delivery. Indian J Pharm Sci. 2016. PMID 27168675
12. Coluzzi F, Mattia C. OROS hydromorphone in chronic pain management. Minerva Anestesiol. 2010. PMID 21102402
13. Correll CU, et al. Pharmacokinetic characteristics of long-acting injectable antipsychotics: an overview. CNS Drugs. 2021. PMID 33507525
14. Schoretsanitis G, et al. Pharmacokinetics and pharmacogenetics in atypical long-acting injectable antipsychotics. Pharmaceutics. 2021. PMID 34201784
15. Spanarello S, La Ferla T. The pharmacokinetics of long-acting antipsychotic medications. Curr Clin Pharmacol. 2014. PMID 23343447
16. Jann MW, Ereshefsky L, Saklad SR. Clinical pharmacokinetics of the depot antipsychotics. Clin Pharmacokinet. 1985. PMID 2864156
17. Harrison TS, Goa KL. Long-acting risperidone: a review of its use in schizophrenia. CNS Drugs. 2004. PMID 14728058
18. de Leon J, et al. Pharmacokinetics of risperidone in different application forms. Eur Neuropsychopharmacol. 2018. PMID 29153926
19. Fagiolini A, et al. Pharmacokinetic simulations for a 2-month long-acting injectable aripiprazole. Curr Med Res Opin. 2025. PMID 39871633
20. Potkin SG, et al. Once-monthly aripiprazole treatment initiation. Curr Med Res Opin. 2013. PMID 23822566
21. McDonnell DP, et al. Post-injection delirium/sedation syndrome with olanzapine long-acting injection. BMC Psychiatry. 2010. PMID 20537130
22. McDonnell DP, et al. Long-term safety and efficacy of olanzapine long-acting injection. Int Clin Psychopharmacol. 2014. PMID 24850228
23. T'jollyn H, et al. Six-monthly paliperidone palmitate: population pharmacokinetic modelling. Eur J Drug Metab Pharmacokinet. 2024. PMID 38769284
24. Kishimoto T, et al. Long-acting injectable vs oral antipsychotics: mirror-image meta-analysis. J Clin Psychiatry. 2013. PMID 24229745
25. Kishimoto T, et al. LAI vs oral for relapse prevention: meta-analysis of randomised trials. Schizophr Bull. 2014. PMID 23256986
26. Ostuzzi G, et al. Psychosis relapse during long-acting injectable treatment: IPD meta-analysis. Lancet Psychiatry. 2020. PMID 32828165
27. LAI vs oral antipsychotics in early-phase schizophrenia: systematic review and meta-analysis. Ther Adv Psychopharmacol. 2024. PMID 38831918
28. Oral drug therapy in the elderly with dysphagia. Clin Interv Aging. 2017. PMID 28203065
29. Crushed tablet administration for dysphagia and enteral feeding. Drugs Aging. 2023. PMID 37707775
30. Dose form modification: a common but potentially hazardous practice. Int Psychogeriatr. 2007. PMID 17711606
31. Misuse of extended-release formulations of stimulant medications. Postgrad Med. 2016. PMID 27467139
32. Impairment of in vitro drug release of oral modified-release preparations in alcohol. Int J Pharm. 2008. PMID 18547758
33. Guidance for feeding-tube administration of oral medications. JPEN J Parenter Enteral Nutr. 2023. PMID 36847617
34. Nurses' adherence to safe medication preparation and administration. Scand J Caring Sci. 2019. PMID 31058362
35. Medicines administration for residents with dysphagia in care homes. Int J Pharm. 2016. PMID 26906457
36. Berner B, John VA. Pharmacokinetic characterisation of transdermal delivery systems. Clin Pharmacokinet. 1994. PMID 8162656
37. Kurz A, Farlow M, Lefevre G. Pharmacokinetics of a novel transdermal rivastigmine patch. Int J Clin Pract. 2009. PMID 19392927
38. Cummings J, Winblad B. A rivastigmine patch for Alzheimer's and Parkinson's disease dementia. Expert Rev Neurother. 2007. PMID 17997695
39. Patkar AA, Pae CU, Zarzar M. Transdermal selegiline. Drugs Today (Barc). 2007. PMID 17612708
40. Robinson DS, Amsterdam JD. The selegiline transdermal system in major depressive disorder: safety and tolerability. J Affect Disord. 2007. PMID 17568687
41. Anderson VR, Scott LJ. Methylphenidate transdermal system in ADHD in children. Drugs. 2006. PMID 16789796
42. New formulations of stimulants: an update for clinicians. J Child Adolesc Psychopharmacol. 2019. PMID 31038360
43. Lowenthal DT, et al. Clinical pharmacokinetics of clonidine. Clin Pharmacokinet. 1988. PMID 3293868
44. Esketamine: a glimmer of hope in treatment-resistant depression. Eur Arch Psychiatry Clin Neurosci. 2019. PMID 31745646
45. Popova V, et al. Flexibly dosed esketamine nasal spray in treatment-resistant depression: a randomised study. Am J Psychiatry. 2019. PMID 31109201

Educational note. This clinical-reasoning essay is for clinicians and students. It is educational, not treatment advice for any individual. Care decisions belong with the treating clinician. At Weave, care is led by Dr. Niharika Reddy, Consultant Psychiatrist.

CRISIS SUPPORT

Tele-MANAS 14416, 1800-891-4416 (24x7, Government of India)

Emergency 112

iCall 9152987821 (Mon-Sat, 10am-8pm; hours may vary)

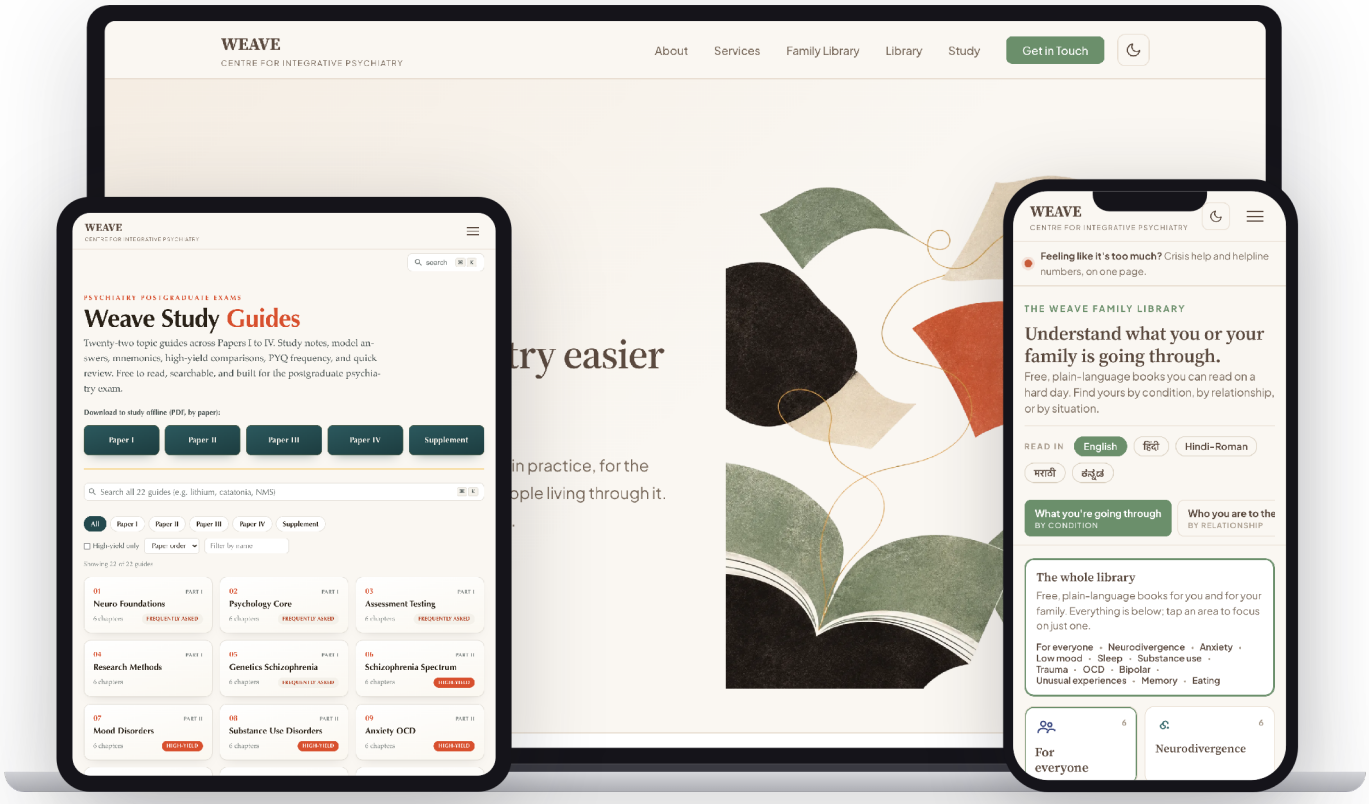
Vandrevala Foundation 1860-2662-345 (24x7)

AASRA 9820466726 (24x7)

CROSS-PROMOTION

More from Weave

Four free destinations for clinicians, students and families. Scan any code to open.



/library	/study	/family	/revision
Clinical field guides and references, most free to read and download.	Postgraduate exam study guides across Papers I to IV.	Plain-language books in English, Hindi, Hinglish, Marathi, Kannada.	A Paper a Day: the whole written exam in one free book.

weave.clinic · /library · /study · /family · /revision · study group · @doc.wilfred.md · @doc.niharika.md

WEAVE

CENTRE FOR INTEGRATIVE PSYCHIATRY

weave.clinic

wilfred@weave.clinic · niharika@weave.clinic

@doc.wilfred.md · @doc.niharika.md

Dr. Wilfred D'souza · Dr. Niharika Reddy