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## Neuroscience-based Nomenclature (NbN): A call for action

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The existing nomenclature for psychotropics is indication based and includes classes such as: *Antidepressant*, *Antipsychotic*, *Anxiolytic*, *Hypnotic*, *Mood stabiliser*, *Stimulant* and *“Other”*.

This nomenclature often leads to awkward clinical situations; we prescribe “antidepressants” in anxiety disorder (Klein 1964) and “antipsychotics” in depression and anxiety (Komossa et al. 2010; Zohar & Allgulander 2011). Almost all clinicians have been faced with questions from patients with anxiety disorder such as “Doctor, I am not depressed so why are you giving me antidepressants?” The gap is growing even wider in the case of “antipsychotics” given for depression (or anxiety): “Doctor, is my situation so bad that you give me antipsychotics?”

The implications of the discrepancy between the current naming of psychotropics and the way they are used in the clinical situation have clear consequences on adherence. The nomenclature that we are currently using is confusing, not informative and does not help to explain to our patients the rationale of picking a specific medication.

Moreover, this nomenclature does not provide the relevant pharmacological anchors to assist clinicians in making an informed choice of the next (or first) pharmacological move.

Surprisingly enough, the current nomenclature has not been systematically reviewed for 60 years and is largely based on concepts and knowledge from the 1960s. (In relation to DSM it is equivalent to DSM-II and in an ICD perspective it is parallel to ICD-6.)

Hence, it is no wonder that key and significant concepts and findings in neuroscience are not embedded. A simple example would be imipramine. It belongs to the “antidepressants” since its potential therapeutic benefit in panic disorder was discovered almost 20 years later (Klein 1964). (Even nowadays imipramine

does not have an approved indication for panic for the same historical reasons.) Another example would be a more recent one: the term “atypical antipsychotics” largely reflects the date when they were marketed rather than their relevant pharmacological characteristics. Grouping them together under the “copy writer” invention of “second-generation antipsychotics” might be a brilliant marketing strategy, but it does not provide the needed information for the clinician as this term includes five different types of medications: (1) D2 receptor antagonists (e.g., amisulpride), (2) D2 and SHT2 receptor antagonists (e.g., olanzapine), (3) D2,5HT1A partial agonists (e.g., aripiprazole), (4) D2,5HT2 and NE $\alpha$ 2 receptor antagonists (e.g., clozapine), and (5) D2,5HT2 receptor antagonists and NE reuptake inhibitors (e.g., quetiapine). Moreover, it turns out to be confusing for patients when used for other indications (Zohar & Allgulander 2011).

Our expectations from a nomenclature are:

1. It should be based on contemporary neuroscientific knowledge.
2. It should help clinicians to make informed choices when they are trying to figure out what would be the next “pharmacological step”.
3. It should decrease stigma and enhance adherence by a naming system that lays out the rationale for selecting a specific psychotropic.
4. Be future-proof, i.e., capable of accommodating new types of compounds.

None of those are being met by the current nomenclature.

In 2008, the *Nomenclature Taskforce* was initiated. The core group was composed of representatives from five international organisations with specific expertise in psychopharmacology:

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ECNP – European College of Neuropsychopharmacology  
 ACNP – American College of Neuropsychopharmacology  
 AsCNP – Asian College of Neuropsychopharmacology  
 CINP – International College of Neuropsychopharmacology  
 IUPHAR – International Union of Basic and Clinical Pharmacology

The mission was “to examine ways of improving the current nomenclature in Psychopharmacology”.

The product of this work is a *pharmacologically driven* nomenclature which was named Neuroscience-based Nomenclature (NbN). As of now, it incorporates 108 psychotropics and focuses on reflecting current knowledge and on the understanding of the neurotransmitter/molecule/system being modified (“*pharmacological domain*”) and its mode/mechanism of action (“*mode of action*”) (Zohar et al. 2015) (NbN website <http://nbnomenclature.org/>).

The NbN includes also four layers of additional information which provide regulatory, clinical and neurobiological information aiming to provide

clinicians with relevant, cutting edge information, which will help to make informed decisions in prescribing psychopharmacological compounds (Table 1; Figure 1).

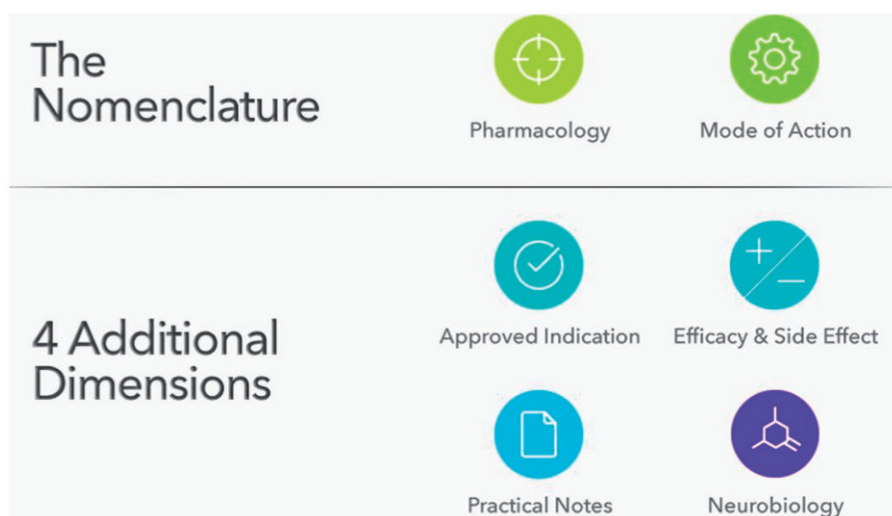
As it turns out, the NbN helps to expand our vocabulary; instead of using seven terms (Antidepressant, Antipsychotic, Anxiolytic, Hypnotic, Mood stabiliser, Stimulant and “Other”) we have 11 pharmacological domains: (1) Acetylcholine, (2) Ion Channel, (3) Dopamine, (4) GABA, (5) Glutamate, (6) Histamine, (7) Melatonin, (8) Norepinephrine, (9) Opioid, (10) Serotonin and (11) lithium (Figure 1, Pharmacology); and 10 modes of action: (1) receptor agonist, (2) receptor antagonist, (3) receptor action, (4) reuptake inhibitor, (5) reuptake inhibitor and releaser, (6) reuptake inhibitor and receptor antagonist, (7) enzyme inhibitor, (8) enzyme interaction, (9) ion channel blocker and (10) positive allosteric modulator. These 11 pharmacological targets and 10 modes of actions can be used (in different combinations) as the cornerstones for describing psychotropics (Figure 1, Mode of Action).

The NbN has been presented to more than 2,000 clinicians in four continents (America, Europe, Asia and Africa). About three-quarters believed that this is “a step in the right direction” (Zohar et al. 2014). Furthermore, in several meetings with editors/representatives of more than 15 major psychiatric journals it was agreed to recommend that future submissions (as of May 2016) to those journals should adopt NbN.

As an integral and very important part of NbN a special app (NbN) was developed. It is free of charge and available on Google Play <https://play.google.com/store/apps/details?id=il.co.inmanage.nbnomenclature> or Apple Store <https://itunes.apple.com/us/app/nbn->

**Table 1.** Four layers of additional information.

1	Approved indications	Based on the recommendations of major regulatory bodies (e.g., FDA, EMA, etc.).
2	Efficacy and side effects	Aimed to highlight the situations where the compound fell short of approval for a formal indication, although there is evidence to support its use, for example, in expert guidelines. With regard to side effects, only prevalent or life-threatening side effects are included.
3	“Practical note”	Summarizes the clinical knowledge that has been prioritised by “filtering” though the taskforce’s “opinion sieve”.
4	Neurobiology	Presents empirical data divided into preclinical and clinical sections, with an emphasis on the latter.



**Figure 1.** The structure of NbN.

neuroscience-based-nomenclature/id927272449?mt=8 and makes NbN easily (and freely) accessible.

The app provides full descriptions of each of the 108 compounds currently available. Moreover, the search engine includes the medication's former terminology, pharmacological target, mode of action, approved indication, efficacy, side effects and any combination of the above.

The NbN harnesses pharmacology and contemporary neuroscientific knowledge as the driving force for the new classification of psychotropics. The emphasis on pharmacology provides the clinician with an option to be more precise in selecting the right medication for a specific patient at a given time.

If we want to improve treatment and adherence we need to update (and expand) our pharmacology vocabulary. The NbN as a pharmacologically driven nomenclature, provides us with a tool to do so.

*The World Journal of Biological Psychiatry* decided to join this initiative together with more than 15 leading psychiatrists journals (including *European Neuropsychopharmacology*, *Neuropsychopharmacology*, *The International Journal of Neuropsychopharmacology*, *Journal of Psychopharmacology* and *Clinical Psychopharmacology and Neuroscience*).

As of May 2016 we recommend that future submissions use the NbN (see instructions for authors <http://nbnomenclature.org/authors>). *The World Journal of Biological Psychiatry* believes that by doing so it provides a better nomenclature for psychiatrists (and patients).

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