TECHNICAL COMMENTARY

Mode of administration

Introduction

Studies have shown that people with bipolar disorder can relapse due to lack of adherence to prescribed medications. Long-acting injectable medications are a treatment option for those who are not adhering to, or do not remember to take, their prescribed oral preparations. This topic assesses whether injectable medications are more effective than placebo or oral preparations for treating symptoms of bipolar disorder.

Method

We have included only systematic reviews (systematic literature search, detailed methodology with inclusion/exclusion criteria) published in full text, in English, from the year 2010 that report results separately for people with a diagnosis of bipolar or related disorders. Reviews were identified by searching the databases MEDLINE, EMBASE and PsycINFO. Hand searching reference lists of identified reviews was also conducted. When multiple copies of review topics were found, the most recent and/or comprehensive review was included. Reviews with pooled data were given priority for inclusion.

Review reporting assessment was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist,which describes a preferred way to present a meta-analysis[1]. Reviews reporting less than 50% of items have been excluded from the library. The PRISMA flow diagram is a suggested way of providing information about studies included and excluded with reasons for exclusion. Where no flow diagram has been presented by individual reviews, but identified studies have been described in the text, reviews have been checked for this item. Note that early reviews may have been guided by less stringent reporting checklists than the PRISMA, and that some reviews may have been limited by journal guidelines.

Evidence was graded using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) Working Group approach where high quality evidence such as that gained from randomised controlled trials (RCTs) may be downgraded to moderate or low if review and study quality is limited, if there is inconsistency in results, indirect comparisons, imprecise or sparse data and high probability of reporting bias. It may also be downgraded if risks associated with the intervention or other matter under review are high. Conversely, low quality evidence such as that gained from observational studies may be upgraded if effect sizes are large or if there is a dose dependent response. We have also taken into account sample size and whether results are consistent, precise and direct with low associated risks (see end of table for an explanation of these terms)[2]. The resulting table represents an objective summary of the available evidence, although the conclusions are solely the opinion of staff of NeuRA (Neuroscience Research Australia).

Results

We found one systematic review that met inclusion criteria[3].

- High quality evidence suggests a small to medium-sized effect of fewer relapses with long-acting injection second generation antipsychotics than with placebo, with less all-cause treatment discontinuation.
- Moderate to low quality evidence found no differences in relapse rates or all-cause discontinuation between long-acting injection second generation antipsychotics and oral antipsychotics or treatment as usual, although prolactin-related adverse events were found less often with long-acting injection second generation antipsychotics.

Margarete Ainsworth Building, Barker Street, Randwick NSW 2031. Phone: 02 9399 1000. Email: info@neura.edu.au

Prajapati AR, Wilson J, Song F, Maidment I

Second-generation antipsychotic long-acting injections in bipolar disorder: Systematic review and meta-analysis

Bipolar Disorders 2018; 20(8): 687-696

View review abstract online

Comparison 1	**12-24 months of long-acting injectable second generation antipsychotics vs. placebo.**
Summary of evidence	**High quality evidence (large sample, consistent, precise, direct) suggests a small to medium-sized effect of fewer relapses with long-acting injection second generation antipsychotics than with placebo, with less all-cause treatment discontinuation.**

Relapse

A small to medium-sized effect of fewer relapses with long-acting injection second generation antipsychotics;

4 RCTs, N = 929, RR = 0.58, 95%CI 0.49 to 0.68, $p < 0.00001$, $I^2 = 0\%$, $p = 0.42$

Moderator analyses showed no differences in the effect according to adjunctive treatment vs. monotherapy, or rapid vs. non-rapid cycling patients.

All studies were rated as high quality.

Comparison 2	**6-18 months of long-acting second generation antipsychotics vs. active control; oral antipsychotics (3 trials) or treatment as usual (1 trial).**
Summary of evidence	**Moderate to low quality evidence (medium to large sample, inconsistent, imprecise, indirect) found no differences in relapse rates or all-cause discontinuation, although prolactin-related adverse events were found less often with long-acting injection second generation antipsychotics.**

Relapse

No significant differences between groups;

4 RCTs, N = 394, RR = 0.92, 95%CI 0.51 to 1.65, $p = 0.79$, $I^2 = 83\%$, $p = 0.0004$

Subgroup analyses showed that active control performed better than long-acting injection second generation antipsychotics as monotherapy, while long-acting injection second generation antipsychotics performed better than active control as adjunctive treatments.

Studies of patients with rapid cycling bipolar disorder showed significantly greater improvements

Margarete Ainsworth Building, Barker Street, Randwick NSW 2031. Phone: 02 9399 1000. Email: info@neura.edu.au

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with long-acting injection second generation antipsychotics than active control, with no differences in studies of patients without rapid cycling. For depression relapse, long-acting injection second generation antipsychotics performed better than active control. 3 low quality open-label studies found long-acting injection second generation antipsychotics out-performed active control, while the one double-blind study found active control performed better than long-acting injection second generation antipsychotics.	
Risks	There was less all-cause discontinuation with long-acting injection second generation antipsychotics than placebo (RR = 0.72; small effect), and no differences in all-cause discontinuation in the active comparison. For prolactin-related adverse events, long-acting injection second generation antipsychotics performed better than active control.
Consistency in results‡	Consistent for placebo comparison, inconsistent for active control comparison.
Precision in results§	Precise for placebo comparison, imprecise for active control comparison.
Directness of results‖	Direct for placebo comparison, indirect for active control comparison (mixed control conditions).

Explanation of acronyms

CI = confidence interval, I^2 = the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance), N = number of participants, *p* = statistical probability of obtaining that result ($p < 0.05$ generally regarded as significant), RR = risk ratio, vs. = versus

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Explanation of technical terms

* Bias has the potential to affect reviews of both RCT and observational studies. Forms of bias include; reporting bias – selective reporting of results; publication bias - trials that are not formally published tend to show less effect than published trials, further if there are statistically significant differences between groups in a trial, these trial results tend to get published before those of trials without significant differences; language bias – only including English language reports; funding bias - source of funding for the primary research with selective reporting of results within primary studies; outcome variable selection bias; database bias - including reports from some databases and not others; citation bias - preferential citation of authors. Trials can also be subject to bias when evaluators are not blind to treatment condition and selection bias of participants if trial samples are small[4].

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† Different effect measures are reported by different reviews.

Prevalence refers to how many existing cases there are at a particular point in time. Incidence refers to how many new cases there are per population in a specified time period. Incidence is usually reported as the number of new cases per 100,000 people per year. Alternatively some studies present the number of new cases that have accumulated over several years against a person-years denominator. This denominator is the sum of individual units of time that the persons in the population are at risk of becoming a case. It takes into account the size of the underlying population sample and its age structure over the duration of observation.

Reliability and validity refers to how accurate the instrument is. Sensitivity is the proportion of actual positives that are correctly identified (100% sensitivity = correct identification of all actual positives) and specificity is the proportion of negatives that are correctly identified (100% specificity = not identifying anyone as positive if they are truly not).

Weighted mean difference scores refer to mean differences between treatment and comparison groups after treatment (or occasionally pre to post treatment) and in a randomised trial there is an assumption that both groups are comparable on this measure prior to treatment. Standardised mean differences are divided by the pooled standard deviation (or the standard deviation of one group when groups are homogenous) which allows results from different scales to be combined and compared. Each study's mean difference is then given a weighting depending on the size of the sample and the variability in the data. Less than 0.4 represents a small effect, around 0.5 a medium effect, and over 0.8 represents a large effect[4].

Odds ratio (OR) or relative risk (RR) refers to the probability of a reduction (< 1) or an increase (> 1) in a particular outcome in a treatment group, or a group exposed to a risk factor, relative to the comparison group. For example, a RR of 0.75 translates to a reduction in risk of an outcome of 25% relative to those not receiving the treatment or not exposed to the risk factor. Conversely, a RR of 1.25 translates to an increased risk of 25% relative to those not receiving treatment or not having been exposed to a risk factor. A RR or OR of 1.00 means there is no difference between groups. A medium effect is considered if RR > 2 or < 0.5 and a large effect if RR > 5 or < 0.2[5]. lnOR stands for logarithmic OR where a lnOR of 0 shows no difference between groups. Hazard ratios measure the effect of an explanatory variable on the hazard or risk of an event.

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Correlation coefficients (eg, r) indicate the strength of association or relationship between variables. They can provide an indirect indication of prediction, but do not confirm causality due to possible and often unforseen confounding variables. An r of 0.10 represents a weak association, 0.25 a medium association and 0.40 and over represents a strong association. Unstandardised (*b*) regression coefficients indicate the average change in the dependent variable associated with a 1 unit change in the independent variable, statistically controlling for the other independent variables. Standardised regression coefficients represent the change being in units of standard deviations to allow comparison across different scales.

‡ Inconsistency refers to differing estimates of effect across studies (i.e. heterogeneity or variability in results) that is not explained by subgroup analyses and therefore reduces confidence in the effect estimate. I^2 is the percentage of the variability in effect estimates that is due to heterogeneity rather than sampling error (chance) - 0% to 40%: heterogeneity might not be important, 30% to 60%: may represent moderate heterogeneity, 50% to 90%: may represent considerable heterogeneity and over this is considerable heterogeneity. I^2 can be calculated from Q (chi-square) for the test of heterogeneity with the following formula[4];

$$I^2 = \left(\frac{Q - df}{Q}\right) \times 100\%$$

§ Imprecision refers to wide confidence intervals indicating a lack of confidence in the effect estimate. Based on GRADE recommendations, a result for continuous data (standardised mean differences, not weighted mean differences) is considered imprecise if the upper or lower confidence limit crosses an effect size of 0.5 in either direction, and for binary and correlation data, an effect size of 0.25. GRADE also recommends downgrading the evidence when sample size is smaller than 300 (for binary data) and 400 (for continuous data), although for some topics, these criteria should be relaxed[6].

‖ Indirectness of comparison occurs when a comparison of intervention A versus B is not available but A was compared with C and B was compared with C, which allows indirect comparisons of the magnitude of effect of A versus B. Indirectness of population, comparator and/or outcome can also occur when the available evidence regarding a particular population, intervention, comparator, or outcome is not available and is therefore inferred from available evidence. These inferred treatment effect sizes are of lower quality than those gained from head-to-head comparisons of A and B.

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