

## Cochrane Risk of Bias Tool for Randomized Controlled Trials

<b>RANDOM SEQUENCE GENERATION</b> <b>Selection bias (biased allocation to interventions) due to inadequate generation of a randomised sequence.</b>	
<p>Criteria for a judgment of 'Low risk' of bias.</p>	<p>The investigators describe a random component in the sequence generation process such as:</p> <ul style="list-style-type: none"> <li>• Referring to a random number table;</li> <li>• Using a computer random number generator;</li> <li>• Coin tossing;</li> <li>• Shuffling cards or envelopes;</li> <li>• Throwing dice;</li> <li>• Drawing of lots;</li> <li>• Minimization*.</li> </ul> <p>*Minimization may be implemented without a random element, and this is considered to be equivalent to being random.</p>
<p>Criteria for the judgment of 'High risk' of bias.</p>	<p>The investigators describe a non-random component in the sequence generation process. Usually, the description would involve some systematic, non-random approach, for example:</p> <ul style="list-style-type: none"> <li>• Sequence generated by odd or even date of birth;</li> <li>• Sequence generated by some rule based on date (or day) of admission;</li> <li>• Sequence generated by some rule based on hospital or clinic record number.</li> </ul> <p>Other non-random approaches happen much less frequently than the systematic approaches mentioned above and tend to be obvious. They usually involve judgement or some method of non-random categorization of participants, for example:</p> <ul style="list-style-type: none"> <li>• Allocation by judgement of the clinician;</li> <li>• Allocation by preference of the participant;</li> <li>• Allocation based on the results of a laboratory test or a series of tests;</li> <li>• Allocation by availability of the intervention.</li> </ul>
<p>Criteria for the judgment of 'Unclear risk' of bias.</p>	<p>Insufficient information about the sequence generation process to permit judgement of 'Low risk' or 'High risk'.</p>

<b>ALLOCATION CONCEALMENT</b>	
<b>Selection bias (biased allocation to interventions) due to inadequate concealment of allocations prior to assignment.</b>	
Criteria for a judgment of 'Low risk' of bias.	<p>Participants and investigators enrolling participants could not foresee assignment because one of the following, or an equivalent method, was used to conceal allocation:</p> <ul style="list-style-type: none"> <li>• Central allocation (including telephone, web-based and pharmacy-controlled randomization);</li> <li>• Sequentially numbered drug containers of identical appearance;</li> <li>• Sequentially numbered, opaque, sealed envelopes.</li> </ul>
Criteria for the judgment of 'High risk' of bias.	<p>Participants or investigators enrolling participants could possibly foresee assignments and thus introduce selection bias, such as allocation based on:</p> <ul style="list-style-type: none"> <li>• Using an open random allocation schedule (e.g. a list of random numbers);</li> <li>• Assignment envelopes were used without appropriate safeguards (e.g. if envelopes were unsealed or non-opaque or not sequentially numbered);</li> <li>• Alternation or rotation;</li> <li>• Date of birth;</li> <li>• Case record number;</li> <li>• Any other explicitly unconcealed procedure.</li> </ul>
Criteria for the judgment of 'Unclear risk' of bias.	<p>Insufficient information to permit judgement of 'Low risk' or 'High risk'. This is usually the case if the method of concealment is not described or not described in sufficient detail to allow a definite judgement – for example if the use of assignment envelopes is described, but it remains unclear whether envelopes were sequentially numbered, opaque and sealed.</p>
<b>SELECTIVE REPORTING</b>	
<b>Reporting bias due to selective outcome reporting.</b>	
Criteria for a judgment of 'Low risk' of bias.	<p>Any of the following:</p> <ul style="list-style-type: none"> <li>• The study protocol is available and all of the study's pre-specified (primary and secondary) outcomes that are of interest in the review have been reported in the pre-specified way;</li> <li>• The study protocol is not available but it is clear that the published reports include all expected outcomes, including those that were pre-specified (convincing text of this nature may be uncommon).</li> </ul>
Criteria for the judgment of 'High risk' of bias.	<p>Any one of the following:</p> <ul style="list-style-type: none"> <li>• Not all of the study's pre-specified primary outcomes have been reported;</li> <li>• One or more primary outcomes is reported using measurements, analysis methods or subsets of the data (e.g. subscales) that were not pre-specified;</li> <li>• One or more reported primary outcomes were not pre-specified</li> </ul>

	<p>(unless clear justification for their reporting is provided, such as an unexpected adverse effect);</p> <ul style="list-style-type: none"> <li>• One or more outcomes of interest in the review are reported incompletely so that they cannot be entered in a meta-analysis;</li> <li>• The study report fails to include results for a key outcome that would be expected to have been reported for such a study.</li> </ul>
<p>Criteria for the judgment of 'Unclear risk' of bias.</p>	<p>Insufficient information to permit judgement of 'Low risk' or 'High risk'. It is likely that the majority of studies will fall into this category.</p>

<b>OTHER BIAS</b> <b>Bias due to problems not covered elsewhere in the table.</b>	
Criteria for a judgment of 'Low risk' of bias.	The study appears to be free of other sources of bias.
Criteria for the judgment of 'High risk' of bias.	There is at least one important risk of bias. For example, the study: <ul style="list-style-type: none"> <li>• Had a potential source of bias related to the specific study design used; or</li> <li>• Has been claimed to have been fraudulent; or</li> <li>• Had some other problem.</li> </ul>
Criteria for the judgment of 'Unclear risk' of bias.	There may be a risk of bias, but there is either: <ul style="list-style-type: none"> <li>• Insufficient information to assess whether an important risk of bias exists; or</li> <li>• Insufficient rationale or evidence that an identified problem will introduce bias.</li> </ul>
<b>BLINDING OF PARTICIPANTS AND PERSONNEL</b> <b>Performance bias due to knowledge of the allocated interventions by participants and personnel during the study.</b>	
Criteria for a judgment of 'Low risk' of bias.	Any one of the following: <ul style="list-style-type: none"> <li>• No blinding or incomplete blinding, but the review authors judge that the outcome is not likely to be influenced by lack of blinding;</li> <li>• Blinding of participants and key study personnel ensured, and unlikely that the blinding could have been broken.</li> </ul>
Criteria for the judgment of 'High risk' of bias.	Any one of the following: <ul style="list-style-type: none"> <li>• No blinding or incomplete blinding, and the outcome is likely to be influenced by lack of blinding;</li> <li>• Blinding of key study participants and personnel attempted, but likely that the blinding could have been broken, and the outcome is likely to be influenced by lack of blinding.</li> </ul>
Criteria for the judgment of 'Unclear risk' of bias.	Any one of the following: <ul style="list-style-type: none"> <li>• Insufficient information to permit judgment of 'Low risk' or 'High risk';</li> <li>• The study did not address this outcome.</li> </ul>

<b>BLINDING OF OUTCOME ASSESSMENT</b> <b>Detection bias due to knowledge of the allocated interventions by outcome assessors.</b>	
Criteria for a judgment of 'Low risk' of bias.	Any one of the following: <ul style="list-style-type: none"> <li>No blinding of outcome assessment, but the review authors judge that the outcome measurement is not likely to be influenced by lack of blinding;</li> <li>Blinding of outcome assessment ensured, and unlikely that the blinding could have been broken.</li> </ul>
Criteria for the judgment of 'High risk' of bias.	Any one of the following: <ul style="list-style-type: none"> <li>No blinding of outcome assessment, and the outcome measurement is likely to be influenced by lack of blinding;</li> <li>Blinding of outcome assessment, but likely that the blinding could have been broken, and the outcome measurement is likely to be influenced by lack of blinding.</li> </ul>
Criteria for the judgment of 'Unclear risk' of bias.	Any one of the following: <ul style="list-style-type: none"> <li>Insufficient information to permit judgment of 'Low risk' or 'High risk';</li> <li>The study did not address this outcome.</li> </ul>
<b>INCOMPLETE OUTCOME DATA</b> <b>Attrition bias due to amount, nature or handling of incomplete outcome data.</b>	
Criteria for a judgment of 'Low risk' of bias.	Any one of the following: <ul style="list-style-type: none"> <li>No missing outcome data;</li> <li>Reasons for missing outcome data unlikely to be related to true outcome (for survival data, censoring unlikely to be introducing bias);</li> <li>Missing outcome data balanced in numbers across intervention groups, with similar reasons for missing data across groups;</li> <li>For dichotomous outcome data, the proportion of missing outcomes compared with observed event risk not enough to have a clinically relevant impact on the intervention effect estimate;</li> <li>For continuous outcome data, plausible effect size (difference in means or standardized difference in means) among missing outcomes not enough to have a clinically relevant impact on observed effect size;</li> <li>Missing data have been imputed using appropriate methods.</li> </ul>
Criteria for the judgment of 'High risk' of bias.	Any one of the following: <ul style="list-style-type: none"> <li>Reason for missing outcome data likely to be related to true outcome, with either imbalance in numbers or reasons for missing data across intervention groups;</li> <li>For dichotomous outcome data, the proportion of missing outcomes compared with observed event risk enough to induce clinically relevant bias in intervention effect estimate;</li> </ul>

	<ul style="list-style-type: none"> <li>• For continuous outcome data, plausible effect size (difference in means or standardized difference in means) among missing outcomes enough to induce clinically relevant bias in observed effect size;</li> <li>• ‘As-treated’ analysis done with substantial departure of the intervention received from that assigned at randomization;</li> <li>• Potentially inappropriate application of simple imputation.</li> </ul>
Criteria for the judgment of ‘Unclear risk’ of bias.	<p>Any one of the following:</p> <ul style="list-style-type: none"> <li>• Insufficient reporting of attrition/exclusions to permit judgement of ‘Low risk’ or ‘High risk’ (e.g. number randomized not stated, no reasons for missing data provided);</li> <li>• The study did not address this outcome.</li> </ul>

## Thresholds for Converting the Cochrane Risk of Bias Tool to AHRQ Standards (Good, Fair, and Poor)

**Good quality:** All criteria met (i.e. low for each domain)

Using the Cochrane ROB tool, it is possible for a criterion to be met even when the element was technically not part of the method. For instance, a judgment that knowledge of the allocated interventions was adequately prevented can be made even if the study was not blinded, if EPC team members judge that the outcome and the outcome measurement are not likely to be influenced by lack of blinding.

**Fair quality:** One criterion not met (i.e. high risk of bias for one domain) or two criteria unclear, and the assessment that this was **unlikely** to have biased the outcome, and there is no known important limitation that could invalidate the results

**Poor quality:** One criterion not met (i.e. high risk of bias for one domain) or two criteria unclear, and the assessment that this was **likely** to have biased the outcome, and there are important limitations that could invalidate the results

**Poor quality:** Two or more criteria listed as high or unclear risk of bias