Clinical Trials

Clinical trials are the studies with the highest level of evidence (as long as they are done correctly). Trials should be controlled (have a comparison group) and randomized (to insure that the groups are similar at the start of the trial). Blinding is also necessary (when possible) to limit observer bias and maintain the placebo effect (even if the control is an active intervention).

It is important to look at a few factors to determine if a trial can be considered reasonably valid. Randomization and blinding (if possible) should be carried out. There should be concealed allocation (the investigator does not know the group assignment of a subject until after the subject has given informed consent). Subjects in the control group should be similar to those in the treatment group (usually shown in Table 1 of an article). Subjects in both groups should be treated equally other than for the intervention. The follow-up should be complete, with an accounting of everyone who has dropped out, is lost to follow-up or does not receive the treatment assigned. Finally, the analysis should be intent-to treat, that is, subjects should be analyzed as randomized (regardless what treatment they received [even no treatment]).

Validity, or the trustworthiness of a study's results, can be threatened by many factors, including errors in sampling, measurement, and data analysis. Internal validity is the extent to which a study's results are true and supported by the study. External validity is the degree to which a study's findings are generalizable to other settings.

Study errors can be random or systematic. Random error, which is due to chance, can be reduced by increasing the sample size and measurement precision. Systematic error results from bias and influences the study findings in a certain direction. Systematic error cannot be improved by increasing the sample size; it must be addressed by eliminating bias. For example, a study randomizes two groups of patients with diabetes to receive a new medication that lowers blood glucose levels (intervention group) or a placebo (control group), with the study outcome being self-monitored blood glucose (SMBG) measurements. If it were found that most of the intervention group patients recorded fasting morning SMBG levels and most of the control group recorded SMBG levels following the evening meal, any overall differences in glycemic control between the two study groups would be biased by the systematic, between-group differences in SMBG monitoring. When designing studies, systematic error is minimized by ensuring that the comparison groups are sampled, measured, and analyzed in the same way.