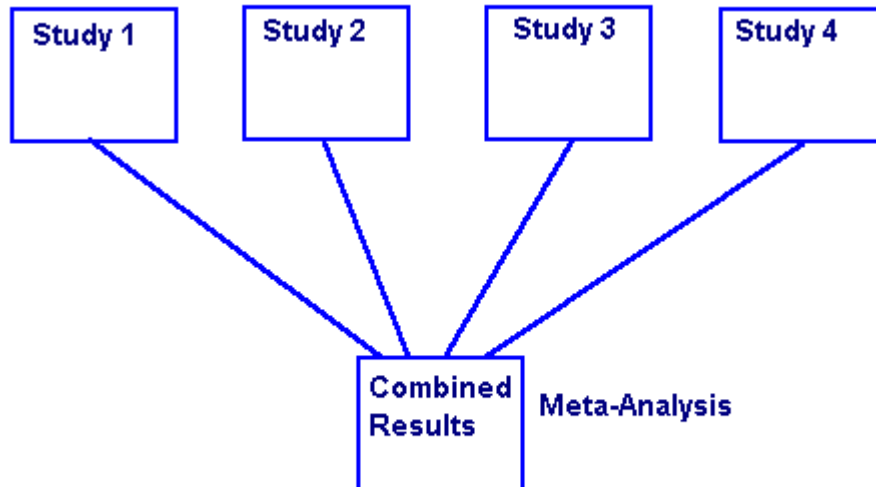


# Types of Studies

## Systematic Reviews and Meta-Analyses



Important medical questions are typically studied more than once, often by different research teams in different locations.

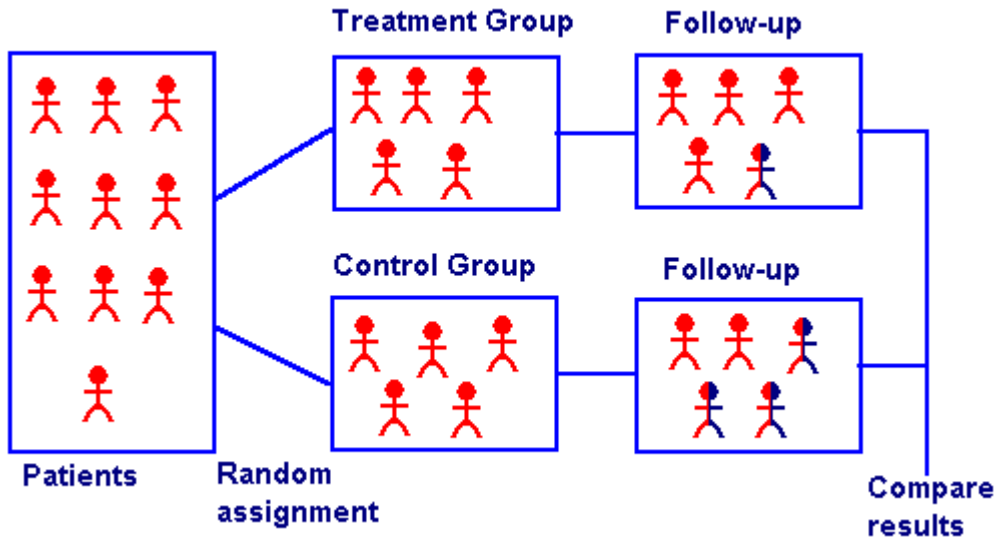
A systematic review is a comprehensive survey of a topic in which all of the primary studies of the highest level of evidence have been systematically identified, appraised and then summarized according to an explicit and reproducible methodology.

A meta-analysis is a survey in which the results of all of the included studies are similar enough statistically that the results are combined and analyzed as if they were one study. In general a good systematic review or meta-analysis will be a better guide to practice than an individual article.

Pitfalls specific to meta-analysis include:

1. It's rare that the results of the different studies precisely agree, and often the number of patients in a single study is not large enough to come up with a decisive conclusion.
2. If the authors are interested in supporting a particular conclusion, they can include studies that support that conclusion and omit studies that do not. Do the authors explain in their paper exactly on what basis they included studies, and do their reasons make sense?
3. Studies that show some kind of positive effect tend to be published more often than those that do not. This means that if the authors include only published studies, several weak positive studies may seem to add up to a strong positive result. Do weak negative studies exist? This effect is known as **Publication bias**.

# Randomized Controlled Studies



A randomized controlled study is one in which:

1. There are two groups, one treatment group and one control group. The treatment group receives the treatment under investigation, and the control group receives either no treatment or some standard default treatment.
2. Patients are randomly assigned to all groups.

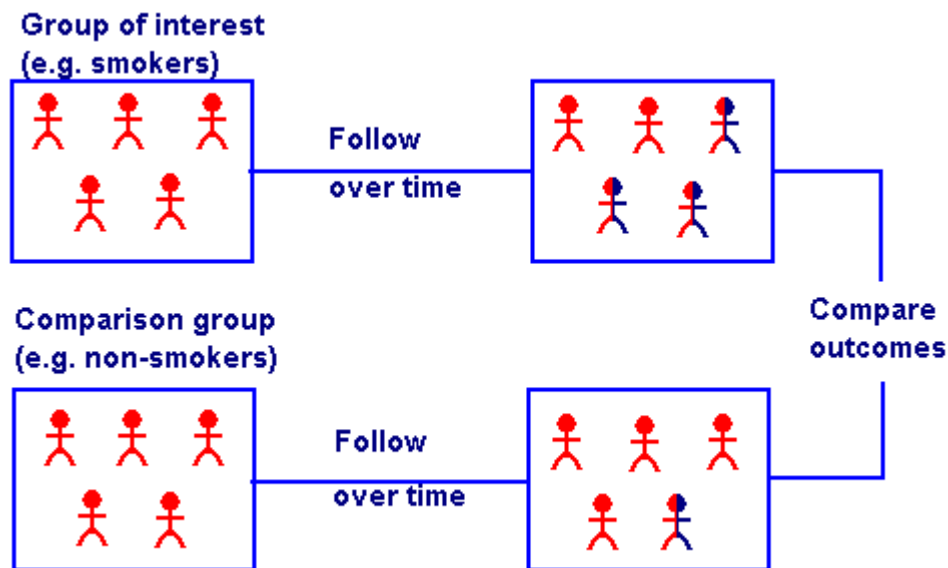
Assigning patients at random reduces the risk of bias and increases the probability that differences between the groups can be attributed to the treatment.

Having a control group allows us to compare the treatment with alternative choices. For instance, the statement that a particular medication cures 40% of cases tells us very little unless we also know how many cases get better on their own! (Or with a different treatment).

With certain research questions, randomized controlled studies cannot be done for ethical reasons. For instance, it would be unethical to attempt to measure the effect of smoking on health by asking one group to smoke two packs a day and another group to abstain, since the smoking group would be subject to unnecessary harm.

Randomized controlled trials are the standard method of answering questions about the effectiveness of different therapies. If you have a therapy question, first look for a randomized controlled trial, and only go on to look for other types of studies if you don't find one.

# Cohort Studies



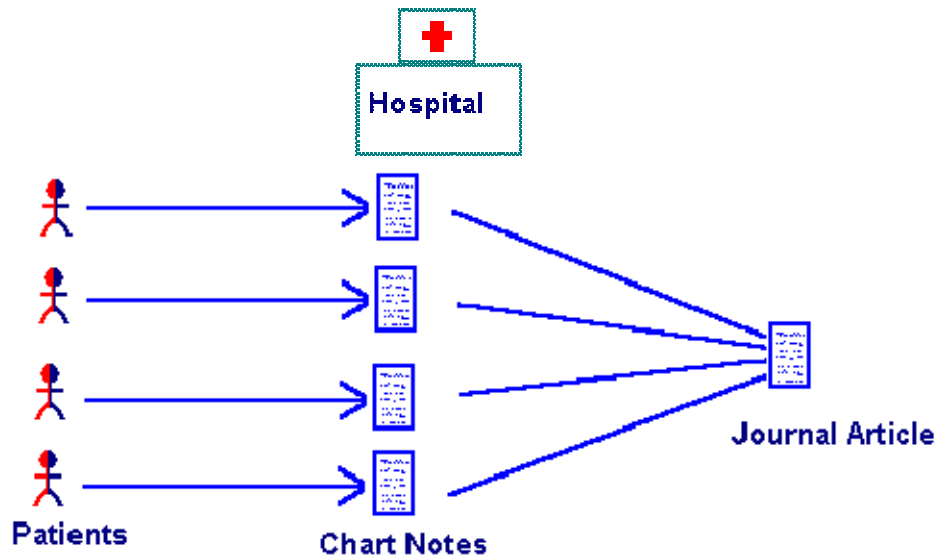
A Cohort Study is a study in which patients who presently have a certain condition and/or receive a particular treatment are followed over time and compared with another group who are not affected by the condition under investigation.

For instance, since a randomized controlled study to test the effect of smoking on health would be unethical, a reasonable alternative would be a study that identifies two groups, a group of people who smoke and a group of people who do not, and follows them forward through time to see what health problems they develop.

Cohort studies are not as reliable as randomized controlled studies, since the two groups may differ in ways other than in the variable under study. For example, if the subjects who smoke tend to have less money than the non-smokers, and thus have less access to health care, that would exaggerate the difference between the two groups.

The main problem with cohort studies, however, is that they can end up taking a very long time, since the researchers have to wait for the conditions of interest to develop. Physicians are, of course, anxious to have meaningful results as soon as possible, but another disadvantage with long studies is that things tend to change over the course of the study. People die, move away, or develop other conditions, new and promising treatments arise, and so on. Even so, cohort studies are generally preferred to case control studies, since they involve far fewer statistical problems and generally produce more reliable answers.

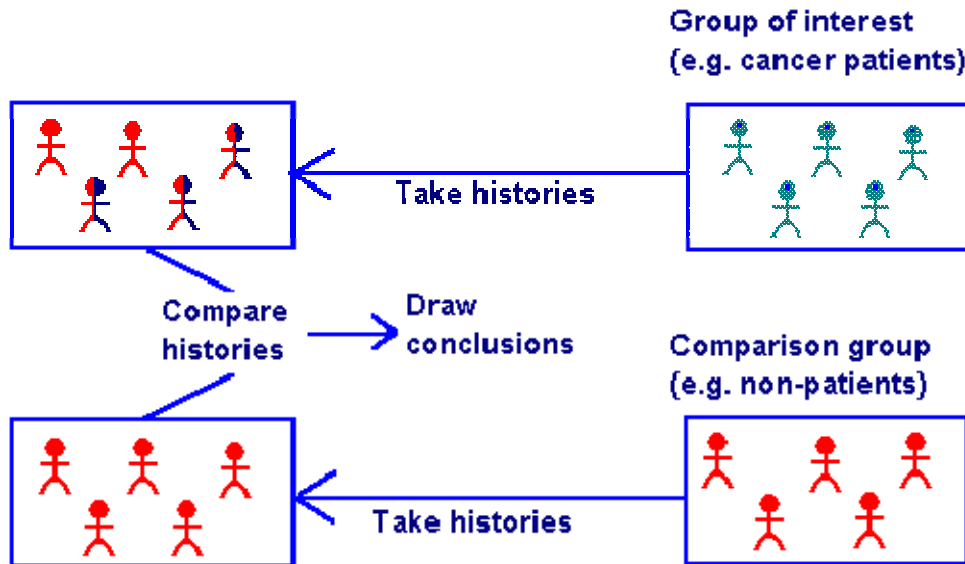
# Case Series and Case Reports



Case series and case reports consist either of collections of reports on the treatment of individual patients, or of reports on a single patient.

For example: one of your patients has a condition that you have never seen or heard of before and you are uncertain what to do. A search for case series or case reports may reveal information that will assist in a diagnosis. However, for any reasonably well-known condition you should be able to get better evidence. Case series and case reports, since they use no control group with which to compare outcomes, have no statistical validity .

# Case Control Studies



Case control studies are studies in which patients who already have a certain condition are compared with people who do not.

For example: a study on which lung cancer patients are asked how much they smoked in the past and the answers are compared with a sample of the general population would be a case control study.

Case control studies are less reliable than either [randomized controlled trials](#) or [cohort studies](#). Just because there is a statistical relationship between two conditions does not mean that one condition actually caused the other. For instance, lung cancer rates are higher for people without a college education (who tend to smoke more), but that does not mean that someone can reduce his or her cancer risk just by getting a college education.

The main advantages of case control studies are:

- They can be done quickly. By asking patients about their past history, researchers can quickly discover effects that otherwise would take many years to show themselves.
- Researchers don't need special methods, control groups, etc. They just take the people who show up at their institution with a particular condition and ask them a few questions.

The first study to suggest a new medical conclusion will often be a case control study, perhaps designed to check on a hypothesis suggested by a [case series](#). If possible, researchers will generally try to confirm the results with a randomized controlled trial or a cohort study.