XII. From Clinical Judgment to Cross-sectional Survey

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A longitudinal study, whether it is a clinical trial or a cohort study, has the virtue of following the logical sequence in which the components of the causality phenomenon occur. However, in a cross-sectional study, this logical sequence does not exist and it is consistent with the measurement of the three components (baseline state, maneuver and result). "Clinical judgment" helps us to artificially reconstruct these components in the time sequence in which they occurred. However, the way in which the population is assembled and how the information is obtained —cross-sectional-wise and retrolectively— entails the risk of producing biases. Although the use of cross-sectional survey in order to associate a maneuver with a probable outcome is difficult and often generates errors (especially when pathological phenomena are studied), it is extraordinary to show the development of a healthy subject simulating a longitudinal study, as is happens when height and weight are estimated according to age; this type of design has been named "longitudinal cross-sectional study".

Key words
cross-sectional studies
cohort studies
case-control studies
clinical trial

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A longitudinal study, whether it is a clinical trial or a cohort study, has the virtue of following the logical sequence in which a phenomenon occurs (at a baseline state, the effect of a maneuver to generate an outcome is observed). In contrast, in a cross-sectional study, this logical sequence does not exist, since at the moment of measurement the three components coincide: baseline state, maneuver and result.

Architectural design (clinical judgment) helps us to artificially reconstruct the components in the time-sequence they occurred. This way, in cross-sectional designs we can even make causality assessments, knowing full well the limitations and risks (Figures 1 to 3). Cross-sectional designs include the case-control study and the cross-sectional survey.

The cross-sectional survey is probably the most widely used design in medical research. In general, except for the analysis of therapeutic maneuvers (in which the clinical trial design is generally used), most causality studies use the cross-sectional survey and only sometimes the cohort design, which is complex and costly due to the large population that must be followed during extended periods.

Cross-sectional survey is characterized for studying a specific population or a sample of such population with data being collected at the same time. That is, the information on the baseline state, the maneuver and the outcome is obtained retrospectively; when the analysis begins, the outcome and the exposure to the maneuver have already happened. Thus, it is not possible to observe the study subject's baseline conditions and their change over time. However, according to the phenomenon of causality logical sequence, it is assumed that the outcome did not exist before the maneuver was applied. So, the intensity and length of exposure to the maneuver can also be reconstructed in order to establish the magnitude of its association with the outcome. Although all the components of the causality phenomenon are measured at one time, the reconstruction of facts should be made following the logical time-sequence (Figure 4).

Exposure to the Maneuver

In cross-sectional survey only the exposure to the maneuver is measured, unlike the clinical trial, where the investigator assigns the maneuver. And unlike the historical cohort, where exposure to the maneuver has already been measured, even though with purposes other than research, in the cross-sectional survey, as in the case-control study, the quality of the maneuver measurement is low. The status of the patient, at the moment of measurement, influences on the accuracy of data (whereby the effect or knowledge of the

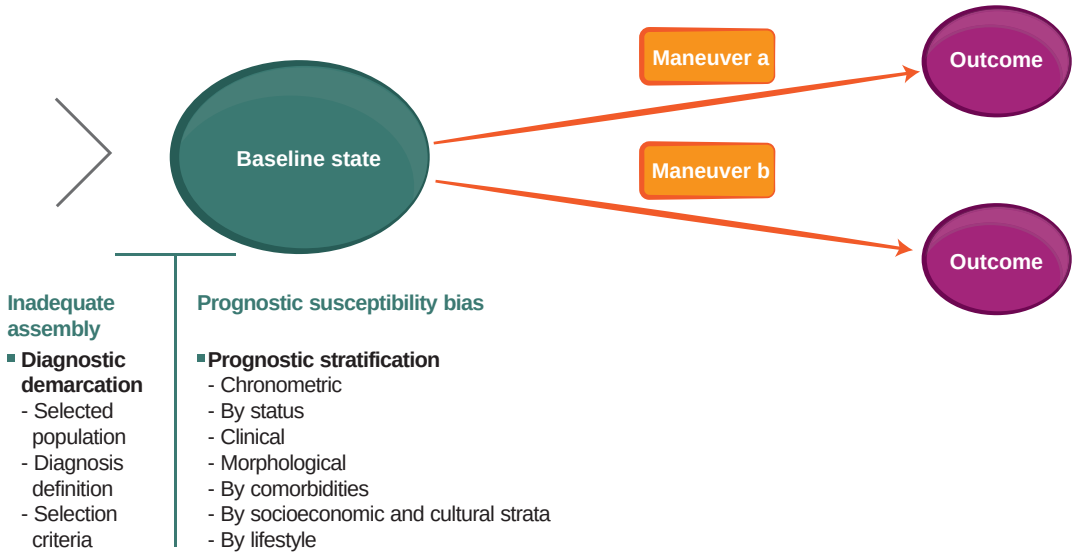

Figure 1 Characteristics that have to be considered in the baseline state in order to prevent an inadequate assembly and susceptibility bias

outcome has some impact) and its distance from the components of the causality phenomenon (the longer the time since the exposure to the maneuver, the less accurate the information). The same happens with the measurement of variables that may confound the effect of the maneuver —conditions previous to the maneuver (baseline state) and conditions accompanying the maneuver in its time (peripheral maneuver)— (Figure 2).

Subject Follow-Up

When the observation of the causality phenomenon components agrees with their time sequence (baseline state, maneuver and outcome), it allows for a series of errors to be predicted and prevented; however, this only happens in clinical trials and the cohort design. In the cross-sectional survey, the assessment of all components is simultaneous —which characterizes it as a cross-sectional study— and the time sequence is artificially reconstructed, but at the risk of placing the maneuver ahead of the outcome or measuring an assumed maneuver that in reality is a consequence of the outcome or a characteristic acompanying the outcome (in a diabetic patient, for example, attributing hypertriglyceridemia to uncontrolled glycemia, when both can be a consequence of other factors).

Although associating an outcome to a probable cause is difficult and errors are frequently generated,

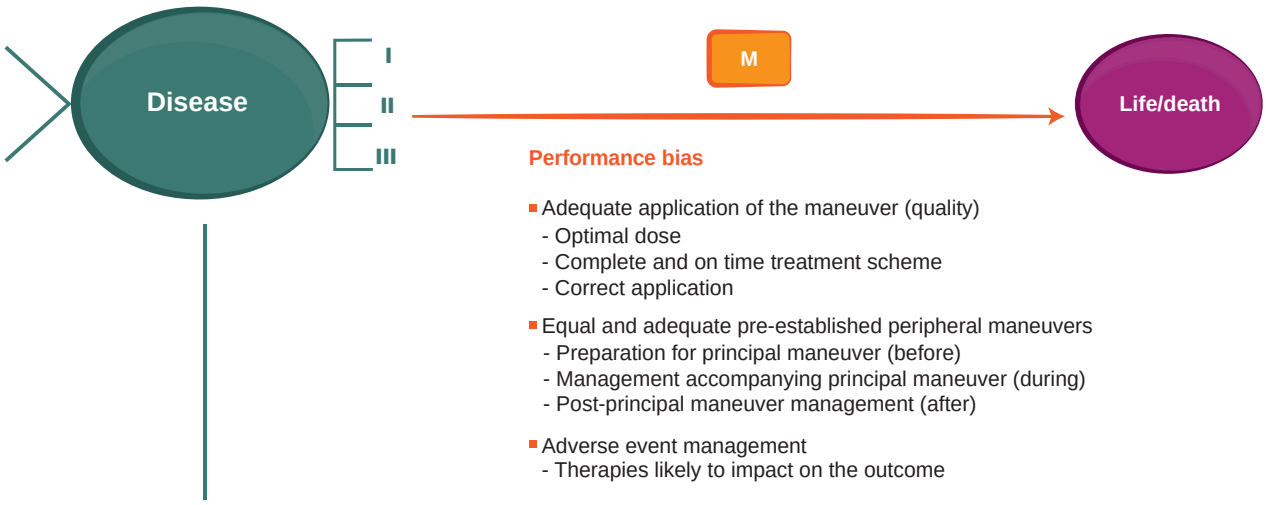

Figure 2 Characteristics that have to be considered during the maneuver in order to avoid performance bias

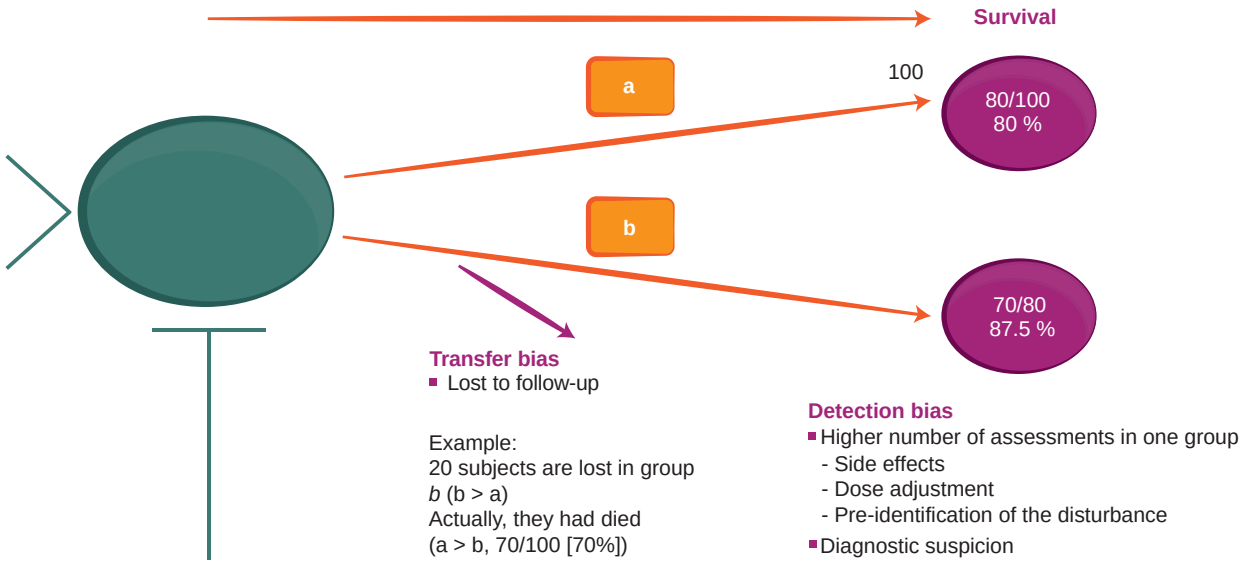

Figure 3 Characteristics that have to be considered during the outcome measurement in order to prevent detection and transfer bias

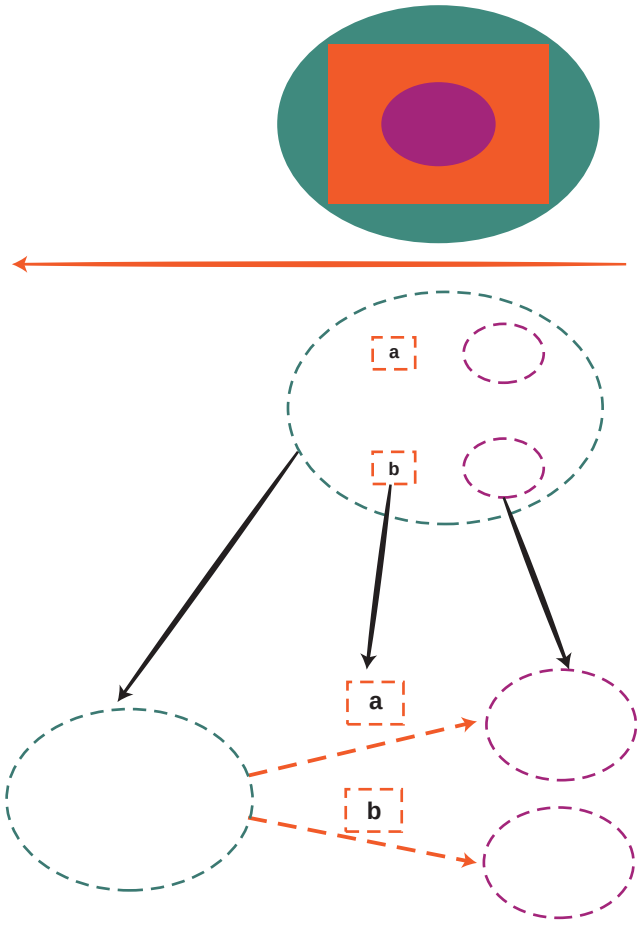

Figure 4 Artificial reconstruction of the causality phenomenon in the cross-sectional survey

cross-sectional survey design is extraordinary for knowing the development of a healthy subject. The height and weight charts for children according to age and sex are an example. These charts were made with cross-sectional measurements of children of each gender and different ages; subsequently, a cohort was simulated where the boy or girl's size and weight changed according to life-years. This design is known as longitudinal cross-sectional study and is suitable for showing the development of the healthy subject, but does not allow for the natural history or clinical course of a disease to be known, since sicker subjects are lost over time and subsequent assessments only include survivors, which renders for false results of the disease evolution to be obtained. However, this design may be useful in diseases with low mortality, as long as the potential effect of the outcome on the measurement of preceding characteristics is controlled.

Directionality in Measurements

Measurement of all the components of the causality phenomenon at the same time is influenced by the fact that exposure to the maneuver has occurred previously on certain baseline conditions, same as the outcome; i.e., measurements directionality turns the cross-sectional survey into a retrolective (retrospective) study. Unlike the historical cohort (or retrolective cohort) —whose measurements directionality makes it also retrolective in nature—, where the record of facts was made sequentially as they went occurring longitudinally, although for reasons other than research, the reconstruction of facts in the cross-sectional survey is

made at the same time, in such way that the temporary nature and magnitude of exposure to the maneuver and co-maneuvers, as well as the baseline conditions —those preceding the maneuver— will depend, most of the time, on the memory of the subject under study, which affects the accuracy of data and attributions of causality due possible biases in the baseline state, the maneuver and the outcome (Figure 4).

Search for Association

The search for causality will always imply comparing regardless of the design. Similarly, cross-sectional survey involves comparing the effect of the maneuver of interest on the baseline state, against its absence or against the effect of other maneuvers.

Phenomenological Recreation of Facts

Being a cross-sectional and retrolective study, recommendations are provided in order to reconstruct the facts as close as possible to the phenomenon of causality.

The process of gathering information should always begin with that what would correspond to the baseline state, specifically with the selection criteria, which must be the same for the entire study population. Similarly, at the baseline state, all the characteristics that might influence on the outcome should be documented, regardless of the maneuver or by interaction with it.

The characteristics of the maneuver and co-maneuver should be defined as far as possible, as well as those of the outcome.

It is necessary to try that among the subjects in whom the outcome of interest has occurred only those recently diagnosed are included, in order for the effect of the principal maneuver to be assessed on it and to reduce the probability of the outcome modifying what the maneuver could have been.

It is essential to take care that the structure where information is obtained is always the same and not to favor any tendency, in order for the subjects' responses not to be biased.

Finally, the collection of information should be segmented, starting with the baseline conditions, continuing with the maneuver, and finishing with the outcome.

Comments

Even when cross-sectional designs (case-control and cross-sectional survey) are somewhat uncomfortable, much of the research used to solve the patients' ailments comes from studies with these designs. Although the actual structure of the phenomenon of causality and the reconstruction of its components in the cross-sectional survey are artificial, they are logical and necessary when using clinical judgment.

Recommended readings

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