Interpretation of Research Results: the Basics

Introduction

Physicians, patients and policy-makers are influenced by the results of research findings and all will make decisions based on such results. Depending on which measures of effect are in the research publication, the impact of an intervention may appear to be very large or very small even although the UNDERLYING DATA are the same. The basis of much of the trials that we need to make treatment decisions on, rests on the comparison of two groups in which the treatments are different, (or treatment is compared to no treatment). We as clinicians are interested to measure this difference and based on the size of this difference, if any, to either change our current treatment practice or remain with the current treatment.

The Concept of Risk

Risk is the probability that an event (disease or outcome) will occur in a particular population. Knowledge of risk often comes from that obtained from cohort studies or other longitudinal studies, (which can also be randomized controlled studies). Risk calculations can be of assistance in many clinical situations:

1. They can help us to associate an etiology to an outcome (e.g. smoking and lung cancer)
2. They can demonstrate the effectiveness of an intervention (treatment) on an outcome such as mortality.
3. They can tell us which therapy is more effective.

The best estimate of risk comes from randomized clinical trials or cohort studies. These studies can separate groups that had different exposures or different treatments and then calculate or measure the risk of an outcome.

Relative Risk (Risk Ratio)

The Relative Risk (RR) is the probability of having an event or developing a disease as compared to a control group. It is calculated as the event rate in the treatment group divided by the event rate in the control group i.e. Relative Risk is a Ratio. Example: annual event rate is 4% in the intervention group and 8% in the control group; then someone in the intervention group has a RR of the event that is half of that of someone in the control group: 4%/8% = 0.50 (50%).

In summary, the relative risk is a ratio of two absolute risks and it measures the strength of effect of treatment (or exposure) on risk. A typical example to demonstrate these principles is the HOPE study (Heart Outcomes Prevention, Evaluation) in which the effect of Ramipril on the cardiovascular events were investigated as compared to Placebo.
Ramipril: 651 with events and 3994 without events: total patients 4645: proportion of patients with events
651/4645 = 0.14 (14%)

Placebo: 826 with events and 3826 without events: total patients 4652: proportion of patients with events
826/4652 = 0.18 (18%)

The Relative Risk = 0.14/0.18 = 0.78. How to interpret this result? The value of 0.78 indicates that patients treated
with Ramipril had a lower risk (beneficial) to develop an event as compared to those patients taking Placebo. To
be of benefit the Risk Ratio (Relative Risk) of the treatment must be below 1. If this value is more than 1 there is
no benefit and there may be harm. The value of 0.78 now has to be subtracted from 1 to get the Relative Risk
Reduction: 1 minus 0.78 = 0.22 (22%). In other words, patients taking Ramipril has a relative risk reduction of
22%. Where does the figure of 1 come from? The concept behind it is as follows: If 10 people in the one group
get the event and 10 people in the other group get the event the Relative Risk is 10/10 = 1 (there is no differ-
ence) and therefore 1 minus 0.78 = 0.22 in this case.

Attributable Risk (Risk Difference)

The attributable risk measures excess risk and is simply the difference between the absolute risks in the
two groups. This difference between the two groups is also called the risk difference or the Absolute Risk
Reduction. In the previous example using Ramipril, the event rate is 0.14% in the Ramipril group and 0.18%
in the Placebo group. The risk difference or absolute risk reduction is then: 0.18 minus 0.14 = 0.04 (or 4%)

Number Needed-To-Treat (NNT)

The number-needed-to-treat is a measure of how many patients needed to be treated to prevent 1 event. This is
a very simple calculation: 1/absolute risk reduction if measured in a proportion (or alternatively, 100/absolute risk
reduction measured as a percentage).

Once again, using the Ramipril example: 1/0.04 = 25 or 100/4 = 25. Therefore, the NNT to prevent 1 event, 25
patients needed to be treated over 5 years (the duration of the trial). The NNT gives a good insight into the clinical
relevance of the treatment effect.

References