EDITORIAL

Is Relative Risk Reduction a Useful Measure for Patients or Families Who Must Choose a Method of Treatment?

IN THIS issue of the Journal of Clinical Oncology, Chao et al report the results of a study that examined the impact of using four different risk/benefit measures when communicating survival benefits to individuals charged with deciding whether to recommend chemotherapy for their mothers. The four measures defined by the authors were relative risk reduction, absolute risk reduction, absolute survival benefit, and number needed to treat. Two hundred four individuals (51 per measure) were randomly assigned to make a decision after being given survival information using one of the measures, then were allowed to make a new decision after receiving the value of all four measures.

The principal findings were that individuals who received only the relative risk reduction information were significantly more likely to endorse chemotherapy, were the least confident in their decision, and were highly likely to change their decision when presented with the other three measures of risk/benefit. In fact, the percentage of individuals who recommended chemotherapy when presented with only relative risk reduction for a small tumor was 51.0%, but this figure decreased to 39.2% when the individuals were presented with all the information. For a larger tumor, 70.6% of the individuals recommended chemotherapy when presented with relative risk information, but the figure decreased to 45.1% when the individuals were provided with complete data.

Decisions based on any of the three other methods of communicating risk did not change nearly as frequently as the decision based on relative risk reduction when all four measures were subsequently presented. The authors concluded that absolute survival benefit was the best measure.

A potential weakness of the study (noted by the authors) was that, for practical reasons, the individuals used in this study were medical students, who almost certainly would understand these measures better than many of the individuals who have to make these difficult decisions in real life. However, this fact only heightens the point that even bright, medically oriented people were uncomfortable using relative risk, a common measure in medical research, to make a treatment decision for a relative.

Three examples presented below help illustrate the difference between the four measures and provide some insight into why the relative risk reduction might be a poor measure to use alone when making an individual treatment decision.

Table 1 lists the survival information used in the first scenario presented to individuals in the Chao et al study. The assumption is that historical data show a particular type of breast cancer patient has an 85% chance of surviving at least 10 years without chemotherapy and an 87% chance with chemotherapy. We can obtain several measures of risk/benefit from the table. For example, from the first column of data, we see that the 10-year survival rate increases by 2% (from 85% to 87%); in other words, the absolute survival benefit (at 10 years) is 2%. Conversely, the risk of dying within 10 years is 15% without chemotherapy and 13% with chemotherapy (second column of the table), so the absolute survival decrement is 2%. The authors refer to this as the absolute risk reduction.

One could also summarize the right column of the table in the following way. If a person has a 15% chance of dying within 10 years without chemotherapy and a 13% chance of dying within 10 years with chemotherapy, the relative risk of death for a patient receiving chemotherapy (relative to the patient not receiving chemotherapy) is 13 divided by 15 (86.7%). Hence the relative risk reduction is 13.3%. The final measure, number needed to treat, stands for the number of patients who would need to be treated before chemotherapy would result in one more survivor. Because the increase in survival is 2% (two divided by 100), 50 patients would need to be treated to result in an increase of one survivor.

The contrast between relative risk reduction and the other measures is particularly striking if one considers Tables 2 and 3. If, as in Table 2, one has a 98% probability of surviving 10 years without chemotherapy and a 99% chance with chemotherapy, the absolute survival benefit is 1%, whereas the relative risk reduction is 50%. It is unlikely that many patients would opt for chemotherapy for the 1% absolute survival benefit, despite the 50% reduction in relative risk. On the other hand, if, as in Table 3, a person had a 50% chance of surviving 10 years without chemotherapy, and a 75% chance with chemotherapy (still a relative risk reduction for death of 50%), it seems likely that most patients would opt for the chemotherapy. The fact that the relative risk reduction is 50% in both cases is less important for decision making than the 25% absolute survival benefit (Table 3) versus 1% (Table 2). The work of Chao et al and the above tables indicate that the survival percentages (85% and 87% for the first example) and the percentage absolute benefit (2%) are of considerably more value to a patient than the relative risk reduction.

I do not mean to imply that relative risk reduction has no importance; in fact, relative risk reduction can be a useful concept for a physician when determining absolute risk. For a particular disease and treatment, the relative risk reduction is often invariant across subsets of patients; in other words, treatment will have the same relative risk reduction in men and women, patients with stage I, II, and III disease, and so on. This is expected unless there is an obvious potential interaction, such as when a hormonal therapy is used in pre- and postmenopausal women. To see how this invariance property can be used to assist in determining the absolute survival benefit for a patient, suppose
a clinical trial comparing a new therapy with no treatment reports a relative risk reduction of 25% for 5-year survival, but the report does not provide data for specific stages. If a physician at an institution has a stage II patient who presents with the disease, the trial results are insufficient to provide the patient with an absolute survival benefit. However, if historical data show 4% of untreated stage II patients at the institution die within 5 years, the 4% rate can be multiplied by the 25% relative risk reduction to conclude that the treatment should result in reducing the 4% failure rate to 3%. This translates into an absolute survival benefit of 1%. If historical data had indicated that the 5-year survival rate for untreated stage II patients was 80%, the 25% relative risk reduction associated with treatment would be expected to reduce the 5-year death rate from 20% to 15%. The absolute survival benefit would be 5%.

In summary, relative risk reduction is known to be a useful tool for researchers and can be of value to a physician when determining absolute risk reduction. However, it does not seem to be a useful measure for patients or families who must choose a method of treatment. Absolute survival benefit seems to be a much more useful measure in that setting.

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AUTHOR’S DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST
The author indicated no potential conflicts of interest.

REFERENCE