Evidence-Based Medicine Series: Part 4

Making Sense of the Numbers

The United Kingdom Prospective Diabetes Study (UKPDS - 38) - Treating Hypertensive Diabetic Patients

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Using the statistical tools of critical appraisal is crucial when reviewing the results of an article. It is necessary for clinicians to apply in house statistics, as any particular treatment can result in differing degrees of benefit depending on the patient situation. This is not an easy task, as many clinicians and students will accept the results presented in the study and will not attempt to further analyze the results. There are many article that address statistical critical appraisal. An article by David Sackett in Evidence Based Medicine, and the Users Guide to the Medical Literature II reviewed some basic, essential statistical measures.

Evidence based medicine (EBM) can help a clinician determine whether treatment A is better than treatment B for a specific patient. The United Kingdom Prospective Diabetes Study (UKPDS-38) trial is described in the ‘In the Literature’ section of this journal. This trial randomized hypertensive patients with Type 2 diabetes to “tight” versus “less tight” blood pressure control (BPC). The patients with tight BPC had fewer diabetes related complications and fewer deaths due to diabetes compared to the patients with less tight BPC. Over 8 years of treatment 16.3% of patients died in the less tight BPC group, compared to 11% in the tight BPC group. What do these numbers tell us in regards to treating patients? To apply these statistics to patients we need to calculate the absolute risk reduction, the relative risk reduction, and the number needed to treat. This can be accomplished simply be designing a 2 by 2 table. For this table the clinician will need the actual numbers of patients in the study.

<table>
<thead>
<tr>
<th></th>
<th>OUTCOME (Deaths)</th>
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<tbody>
<tr>
<td></td>
<td>-ve outcome (death)</td>
</tr>
<tr>
<td>Treatment A (tight control)</td>
<td>a) 84</td>
</tr>
<tr>
<td>Treatment B (less tight control)</td>
<td>c) 64</td>
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Relative Risks

RRa - The relative risk of Treatment A causing the negative outcome (death) is a/(a+b) = 11%

RRb - The relative risk of Treatment B causing the negative outcome (death) is c/(c+d) = 16.3%

RR - The relative risk of death occurring in treatment A compared to treatment B is RRa/RRb = (a/(a+b))/(c/(c+d)) = 0.674

Relative risk reduction (RRR)

RRR - The relative risk reduction is a figure frequently quoted and is calculated by subtracting the RR from 1; (1-RR) x 100% = (1-0.674) x 100% = 32.5%

Absolute risk reduction (ARR)

ARR - The absolute risk reduction is simply the difference between the outcome rates in the two treatment groups; RRb-RRa = 0.63-0.11 = 0.053 = 5.3%

RRR compared to the ARR

The relative risk reduction (RRR) is useful as it indicates that 1 in 3 of the expected deaths were prevented by tight BPC.
But the RRR fails to discriminate absolute treatment effects from those that are trivial. Therefore the use of the ARR gives us a concrete number to determine the size of the effect. The ARR of 5.3% indicates that with tight control, you will save 5.3% of patients from death. One describes the reduction in events (32.5% fewer deaths) and the other describes the reduction in persons affected (5.3% fewer patients died). One advantage of the ARR is that it exemplifies the relationship between the therapeutic effort (treating 100 people) and the clinical yield (saving 5.3 lives).³

**Number Needed to Treat (NNT)**

\[ \text{NNT} = \frac{1}{\text{ARR}} \]

An alternate way of expressing this relationship between therapeutic effort and clinical yield is by taking the inverse of the ARR or \( \frac{1}{5.3\%} = 19 \). This is referred to as the NNT. In the current case, you need to treat 19 patients for 8 years to prevent 1 death from diabetes.

This example illustrates that RRR usually is a big number (eg. 32.5%), and as such they appeal to researchers trying to demonstrate impressive results. The ARR may appear a lot less impressive (5.3%). The NNT (19) highlights the effort necessary to achieve the desired outcome. Other questions can be generated from these numbers. For example is it cost effective to treat 19 patients to save one life? Is 19 patients a good NNT? The answer to these questions has to do with clinical significance not statistical significance. This NNT of 19 is fairly small and the cost of antihypertensive therapy is relatively affordable. In comparison, if you had the same RRR of 32.5%, with a ARR of 0.53% it would result in a NNT of 188. Once cost and side effects are taken into consideration this NNT is obviously less favourable.³ Yet, without completing these calculations, a clinician would have considered that a RRR of 32.5% was quite impressive and may consider using Treatment A, for his patients.

With these considerations in mind, physicians can determine whether one treatment is better that another, and if so, if there is a significant enough improvement in outcome to favour one treatment over another.

Future issues of the UTMJ will contain examples of how to use odds ratios, effect sizes, confidence intervals and other statistical parameters.

**References**

2. Guyatt GH. Sackett DL. Cook DJ. (1994). Users guide to the medical literature. II. How to use an article about therapy or prevention. B. What were the results and will they help me in caring for my patients? JAMA 271(1):59-63.